

# MONTHLY WEATHER REVIEW.

VOL. XII.

WASHINGTON CITY, MARCH, 1884.

No. 3.

## INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States during March, 1884, based upon the reports from the regular and voluntary observers of the Signal Service, and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month are also given, and their approximate paths shown on chart ii.

The following may be mentioned as the most noteworthy features of the month:

1. The continuation of the flood which began in the lower Mississippi river during February. At New Orleans, Louisiana, the river reached a height exceeding by one inch the high stages of 1874 and 1883. Damaging freshets also occurred in the smaller rivers in many states, those occurring in California being especially destructive.

2. The destructive tornadoes and hail storms which occurred in the Southern states on the 25th, during the passage of low area xi.

The month was slightly warmer than the average in the states bordering on the Atlantic south of New England, in the Ohio valley, Tennessee, and the Gulf states. In other sections of the country the mean temperatures were below the normal.

The precipitation of the month was largely in excess of the average in California, Tennessee, and the east Gulf states, while marked deficiencies occurred in the north Pacific coast region, Florida peninsula, and the Rio Grande valley.

In the preparation of this REVIEW the following data, received up to April 20th, 1884, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-two Signal Service stations and fourteen Canadian stations, as telegraphed to this office; one hundred and sixty-one monthly journals, and one hundred and forty-seven monthly means from the former, and fourteen monthly means from the latter; two hundred and seventy-two monthly registers from voluntary observers; forty-eight monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Illinois, Indiana, Iowa, Kansas, Nebraska, Ohio, and Tennessee, and of the Central Pacific railway company; trustworthy newspaper extracts; and special reports.

## ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The distribution of mean atmospheric pressure for March,

1884, determined from the tri-daily telegraphic observations of the Signal Service, is shown by the isobarometric lines on chart iii. This chart shows the mean pressure for the month to have been greatest over northeastern Montana, the upper Missouri valley, and in South Carolina, Georgia and Florida, where barometric means of 30.1 occurred. The regions of least mean pressure comprised the north Pacific coast region and Canadian maritime provinces, where the mean pressure was below 29.95, the lowest mean, 29.91, being reported from Fort Canby, Washington Territory and Sidney, Nova Scotia.

The mean pressure for March, compared with that for the preceding month, shows that a decrease has occurred in all parts of the country, except over a small area in the lake region, where there was no change. The greatest decrease occurred in the upper Missouri valley, Idaho and the Canadian maritime provinces, where it varied from .15 to .17. A decrease ranging from .10 to .15 occurred over the eastern slope of the Rocky mountains, on the north Pacific coast and in New England. In the remaining districts, the deficiencies varied from .01 to .10.

## DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

The mean pressure for March, compared with the normal for the corresponding month, shows deficiencies in the eastern Gulf states and in all districts west of the Mississippi river. The most marked departures occurred over an area extending from Colorado and Utah northwestward to the Pacific coast, where they varied from .11 to .17. In the lake region, Ohio valley, and in the districts on the Atlantic coast, the mean pressure was above the normal, the departures varying from .01 to .11, being greatest in New England.

## BAROMETRIC RANGES.

The barometric ranges over the entire country varied from .34 at Key West, Florida, to 1.42 at Marquette, Michigan. The monthly ranges exceeded 1.25 over an area extending from southern Dakota and eastern Nebraska northeastward to Lake Superior. They were less than .50 in southern Florida, and in the southern parts of Arizona, California, and New Mexico.

In the several districts the monthly barometric ranges have varied as follows:

*New England.*—From .91 at New Haven, Connecticut, to 1.02 at Provincetown, Massachusetts, and 1.07 on the summit of Mount Washington, New Hampshire.

*Middle Atlantic states.*—From .86 at Lynchburg, Virginia, to .99 at Delaware Breakwater, Delaware.

*South Atlantic states.*—From .60 at Jacksonville, Florida, to .88 at Fort Macon, North Carolina.

*Florida peninsula.*—From .34 at Key West, to .50 at Sanford.

*Eastern Gulf states.*—From .56 at New Orleans, Louisiana, to .68 at Montgomery, Alabama.

*Western Gulf states.*—From .61 at Galveston, Texas, to .90 at Fort Smith, Arkansas.

*Rio Grande valley.*—From .61 at Brownsville, Texas, to .67 at Rio Grande City, Texas.

*Ohio valley and Tennessee.*—From .80 at Chattanooga, Knoxville, and Memphis, Tennessee, to .98 at Indianapolis, Indiana, and Louisville, Kentucky.

*Lower lake region.*—From .90 at Oswego, New York, to 1.08 at Detroit, Michigan.

*Upper lake region.*—From 1.07 at Port Huron, Michigan, to 1.42 at Marquette, Michigan.

*Extreme northwest.*—From 1.07 at Bismarek, Dakota, to 1.10 at Saint Vincent, Minnesota.

*Upper Mississippi valley.*—From .91 at Cairo, Illinois, to 1.36 at Saint Paul, Minnesota.

*Missouri valley.*—From 1.17 at Fort Bennett, Dakota, to 1.36 at Yankton, Dakota.

*Northern slope.*—From .69 at Fort Shaw, Montana, to 1.16 at North Platte, Nebraska.

*Middle slope.*—From .62 on the summit of Pike's Peak, Colorado, and .92 at Fort Elliott, Texas, to 1.20 at Dodge City, Kansas.

*Southern slope.*—From .56 at Fort Stockton, Texas, to .81 at Fort Concho, Texas.

*Southern plateau.*—From .36 at Fort Grant, Arizona, to .50 at Fort Thomas, Arizona.

*Middle plateau.*—88 at Salt Lake City, Utah.

*Northern plateau.*—From .94 at Dayton, Washington Territory, to 1.04 at Lewiston, Idaho.

*North Pacific coast region.*—From .91 at Fort Canby, Washington Territory, to .96 at Roseburg, Oregon.

*Middle Pacific coast region.*—From .76 at San Francisco, California, to .96 at Red Bluff, California.

*South Pacific coast region.*—From .37 at Los Angeles, California, to .50 at Yuma, Arizona.

#### AREAS OF HIGH BAROMETER.

I.—The morning report of the 1st showed a rise of .40 of an inch in the barometer over Manitoba; during the day the rise extended over the upper Mississippi valley, and on the 2d over the south Atlantic and east Gulf states. The temperature fell from 10° to 20° in the upper Mississippi and Missouri valleys on the 1st; from 6° to 9° in Tennessee and the east Gulf states on the morning of the 2d; and from 7° to 10° in the south Atlantic states during the day.

II.—This high area first appeared in Manitoba, and at midnight of the 2d the rise extended into the upper Mississippi and Missouri valleys. The temperature had fallen 29° at Fort Garry, 30° at Saint Vincent, Minnesota, and 40° at Bismarek, Dakota. The area of highest pressure was over Iowa and Missouri at midnight of the 3d, over the middle Atlantic coast at midnight of the 4th, and over Nova Scotia at midnight of the 5th. The cold wave reached the middle Atlantic coast on the 3d, and New England on the 4th.

III.—This high area moved from Manitoba into the upper Mississippi valley on the 6th; on the 7th it was over Lake Superior, and on the 8th reached the Saint Lawrence valley. The temperature fell 31° at Cheyenne on the 5th, and 26° at North Platte, Nebraska. The afternoon report of the 6th showed a fall of from 19° to 32° in Colorado, and from 28° to 30° in Arkansas. On the 7th the cold wave had extended into Texas. The winds in Texas had shifted to northerly on the 6th, and the fall of temperature which occurred was continued by high area iv., moving in from the Pacific coast on the 7th. This area was central on the 8th in Kansas, and during the day moved into the Ohio valley, and reached the Atlantic coast on the 10th. The temperature fell from 15° to 30° in Alabama, Tennessee, and the Ohio valley on the 9th, and from 12° to 19° on the middle and south Atlantic coast on the 10th.

V.—This area advanced from the Pacific coast on the 10th. The barometer had risen during the day .70 inch at Roseburg, Oregon, and Red Bluff, California. The rise in the barometer extended over Montana, Wyoming, and Colorado, accompanied by a fall in temperature of from 12° to 23°. On the 11th the barometer rose .84 inch at Omaha, and the temperature in the upper Mississippi and Missouri valleys fell from 13° to 26°. On the 12th the barometer was highest in the Ohio valley, and the temperature had fallen decidedly from the lake region to the Gulf. The cold wave reached the Atlantic coast on the 13th, the area of highest barometer passing eastward off the middle Atlantic coast on this day.

VI.—On the 13th the barometer rose from .20 to .40 in the Missouri valley; it fell from .10 to .20 in Tennessee, the fall extending eastward to the Atlantic coast. At this report the barometer was highest in Dakota, and the temperature had fallen from 10° to 20° in the Missouri valley. On the 14th a barometric ridge extended from Texas to Manitoba, and the cold wave extended over the lake region and New England. On the 15th low area number viii. having developed in the northwest, the area of highest barometer was transferred to the south Atlantic states, and remained highest on the south and middle Atlantic coast during the 16th and 17th.

VII.—This area extended over Montana on the 16th, moved eastward and was over Lake Superior on the 17th, and reached the New England coast on the 19th. On the 17th the cold wave extended over the lake region, the upper Mississippi valley and the west Gulf states, and over the middle Atlantic states, and New England on the 18th.

VIII.—At the morning report of the 20th, an area of high barometer appeared in northern Minnesota, the rise extending over the Ohio valley and Gulf states, where the temperature had fallen from 7° to 14°. The area of highest barometer reached the Atlantic coast on the 21st, where the temperature fell slightly on the 20th and 21st. The area of highest barometer then moved northeasterly and was over Nova Scotia on the 23d.

IX.—This area moved from the coast of California to Colorado on the 25th; into the west Gulf states on the 26th, thence northeasterly to the lower lake region on the 27th. There was a slight fall of temperature on the Pacific coast on the 25th; in Illinois, Indiana, Missouri, Arkansas and Texas on the 26th; by the morning of the 26th, and during the day, a fall of 10° from the lower lake region south, including the east Gulf states, and a slight fall on the Atlantic coast on the 27th.

X.—On the 28th the barometer was highest in Dakota; it had risen .77 at North Platte, Nebraska, with an increase of pressure extending as far south as Texas. On the 29th the area of highest pressure was over Lake Superior; on the 30th over Lake Ontario, and at midnight of the 31st the highest pressure was over the south Atlantic states. The temperature fell decidedly in the upper Mississippi and Missouri valleys on the 28th, from 12° to 20° in the lake region on the 29th, from 8° to 22° in the Ohio valley and Tennessee on the same day. The cold wave reached the Atlantic coast on the 30th, the temperature falling 20° to 30° in New England and from 10° to 20° in the middle Atlantic states.

#### AREAS OF LOW BAROMETER.

Thirteen atmospheric depressions have been traced over and near the limits of the United States during the month of March. They generally reached the Atlantic coast north of 40° north latitude. The depressions traced from the Pacific coast moved, in general, southeasterly until south of 37° north latitude and then recurved to the northeast.

The following table gives the latitude and longitude in which the several depressions were first and last observed and the average hourly velocity of each depression.

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.....	51 00	100 00	47 30	58 00	38.8
II.....	50 30	100 30	41 00	79 30	31.2
III.....	38 00	105 30	46 00	63 30	26.7
IV.....	26 30	98 00	46 00	63 30	40.6
V.....	45 00	126 30	40 00	112 30	34.4
VI.....	42 00	125 30	49 30	06 00	35.6
VII.....	27 30	89 30	45 00	60 00	32.8
VIII.....	37 00	124 00	42 30	63 00	31.1
IX.....	44 30	99 30	46 30	58 00	35.6
X.....	44 30	127 00	50 00	02 00	29.3
XI.....	50 00	74 00	49 00	59 30	34.4
XII.....	47 00	128 00	47 00	00 00	28.3
XIII.....	37 30	105 00	37 00	74 00	32.1
XIII.....	44 30	125 00			
Mean hourly velocity.....					33.3



I.—This low area is a continuation of number xv. described in the February REVIEW. On the morning of March 1st it was central near Keokuk, Iowa. During the day general rains occurred in Tennessee and the Ohio valley, snow in the lake region, and high winds on lakes Michigan and Erie. On the morning of the 2d the storm was central near Cape Henry, Virginia, with high southwest winds on the south Atlantic coast, and high northeast winds and snow on the middle Atlantic coast. During the 2d the storm moved rapidly to the northeast, the centre passing over Nova Scotia on the afternoon of the 3d. The following maximum velocities were reported during the passage of this storm: Sandy Hook, New Jersey, 46; Barnegat City, New Jersey, 32; Delaware Breakwater, Delaware, 34; Milwaukee, Wisconsin, 33; Toledo, Ohio, 27; Cape Henry, Virginia, 25; Fort Macon, North Carolina, 30.

II.—This area of low barometer appeared on the afternoon of the 1st in Manitoba; its course was to the south and east, reaching the Atlantic coast on the afternoon of the 3d. High winds accompanied by snow prevailed over the lake region during the 2d and 3d, and rain in Tennessee and the Ohio valley during the 2d.

III.—This area was first located as a storm-centre in Colorado on the afternoon of the 4th. At the afternoon report of this date, generally fair weather prevailed in all districts east of the Mississippi river. The winds in the upper Mississippi and Missouri valleys had shifted to the south and east with increasing cloudiness during the day, and light snow had fallen in Dakota. The storm moved southeasterly and at midnight of the 5th was central in southern Arkansas. The barometer had fallen from .10 to .50 in all districts east of the Mississippi, and rain had occurred in Tennessee and the Ohio valley, the south Atlantic and east Gulf states, and high northeast to southeast winds and snow on the middle Atlantic and New England coasts. On the morning of the 7th the storm was central in southeastern Texas. Its general course from this time was to the northeast, passing over the Virginia coast near Cape Henry on the afternoon of the 9th. Snow fell in New England on the 8th and 9th, with high northeast winds on the coast. Cloudy and threatening weather prevailed in the lake region on the 6th, and general snows on the 7th and 8th, clearing in upper lakes on the 9th, and in the lower lakes by the morning of the 10th. General rains occurred in all districts south of the fortieth parallel during the passage of this storm. Clearing weather prevailed in the south Atlantic and Gulf states on the 9th and in the middle Atlantic states by the morning of the 10th. The following maximum wind velocities were reported: Indianola, Texas, 33 miles; Pensacola, Florida, 26; Smithville, North Carolina, 41; Fort Macon, North Carolina, 29; Sandy Hook, New Jersey, 36; Barnegat City, New Jersey, 32; Eastport, Maine, 34.

IV.—This depression reached the Oregon coast, near the mouth of the Columbia river, on the night of the 5th; it moved south and then east and disappeared in Utah on the morning of the 7th. General rains occurred on the Pacific coast, but the depression after passing into the interior did not cause any marked change in the meteorological conditions.

V.—Appeared on the coast of Oregon on the morning of the 9th. Its path is traced on chart i. until it disappeared in the Saint Lawrence valley on the night of the 12th. General rains occurred on the Pacific coast on the 8th, 9th, and 10th. On the morning of the 11th the area of precipitation covered the upper Mississippi and Missouri valleys, the lake region, and Tennessee and the Ohio valley, with high winds on the lakes and cloudy and threatening weather on the Atlantic coast. Rain fell in New England and the middle Atlantic states on the 12th with high winds on the coast, the weather clearing during the day in the lake region and by the morning of the 13th in New England. Wind velocities reported during passage of number v.: Milwaukee, Wisconsin, 36 miles; Duluth, Minnesota, 40; Mackinaw City, Michigan, 28; Grand Haven, Michigan, 44; Buffalo, New York, 60; Rochester, New York, 48.

VI.—A slight depression moved southeasterly from the Pacific coast to the Gulf of Mexico during the 12th. From midnight of the 12th to the morning of the 13th the barometer fell .10 in Louisiana, and the depression was central in the Gulf south of Louisiana. The winds on the coast of Texas shifted to northeast during the night of the 11th as the barometer rose after the passage of area number v.; depression number vi. was so slight while to the west of Texas that it had no effect on the direction of these winds. After passing into the Gulf it greatly increased in energy and moved rapidly northeastward. Rain fell in the east Gulf states on the 11th, 12th, and 13th; in the south Atlantic on the 12th, 13th, and 14th; in the middle Atlantic the weather cleared during the afternoon and night of the 12th after low area v. had passed. The rain accompanying number vi. began on the 13th and continued during the 14th, clearing on the morning of the 15th. Rain and snow fell in New England on the 15th. The following wind velocities were reported during the passage of this storm: Fort Macon, North Carolina, 35 miles; Cape Henry, Virginia, 35; Kitty Hawk, North Carolina, 32; Sandy Hook, New Jersey, 29; Atlantic City, New Jersey, 32; Barnegat City, New Jersey, 42; Provincetown, Massachusetts, 27; Eastport, Maine, 27.

VII.—Appeared on the California coast near San Francisco during the night of the 14th; it moved southeasterly and on the morning of the 16th was central in New Mexico, south of Santa Fé; after a slight movement to the northeast it moved southeasterly, and on the morning of the 18th was central southeast of Indianola. Its general direction from this time was northeast, causing general and heavy rains in the Gulf, south and middle Atlantic states, in the lake region, and New England, and high winds on the lakes, and the New England and middle Atlantic coasts.

VIII.—This area was first located in Dakota on the night of the 15th; its general course was northeasterly and then easterly until it disappeared over Nova Scotia on the morning of the 18th. Light rains, and snow in the northern portions, occurred in the lake region and New England. It did not materially effect the meteorological conditions south of 40° north latitude.

IX.—This area appeared on the afternoon of the 18th near the coast of Oregon. At midnight it was central in Washington Territory. Here it divided into two parts, one moving to the northeast, but the greater depression was central the next morning in northwestern Utah. It then moved southeasterly into Texas, and then after a slight movement to the northwest, moved off to the northeast, and reached the Saint Lawrence valley on the afternoon of the 24th. It caused general rains in all districts east of the Mississippi and high winds over the lake region and on the New England and middle Atlantic coasts.

X.—This area passed from the night of the 21st to the afternoon of the 22d across the northern part of the Canadian maritime provinces. It had no effect on the meteorological condition within the limits of the United States.

XI.—This depression was first located on the Oregon coast on the morning of the 22d; on the morning of the 23d central in Utah; 24th, in Texas; 25th, in Missouri; 26th, Michigan; 27th, off the New England coast, and disappeared over Nova Scotia on the morning of the 29th. By the morning of the 24th the rain area extended over the Gulf, south, and middle Atlantic states; on the morning of the 26th the rain area included all districts east of the Mississippi, clearing in all districts on the 27th.

XII.—This area first appeared in Colorado at midnight of the 26th; its course was easterly, disappearing off the Virginia coast on the morning of the 29th. Rain fell in the upper Mississippi and Missouri valleys on the 28th and clearing on the 29th. Light rain also fell in the lake region on the 28th and in the middle Atlantic states on the 29th, but by midnight of this date the weather was clear in all districts east of the Mississippi river.

XIII.—Appeared off the coast of Oregon on the 27th. On the morning of the 29th it was central in southwestern Utah. On the morning of the 30th in Texas, and at midnight of the 31st in northern Kansas; at this report rain was falling in the upper Mississippi and Missouri valleys, with cloudy and threatening weather in the lake region.

#### NORTH ATLANTIC STORMS DURING MARCH, 1884.

[Pressure expressed in inches and in millimetres; wind-force by scale of 0—10.

Chart ii. exhibits the paths of the principal atmospheric depressions that have appeared over the north Atlantic ocean during March, 1884. The location of the various storm-centres has been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels, and from other miscellaneous data received at this office up to April 22, 1884.

The observations used are in general simultaneous, being taken each day at 7 a. m. Washington, or 12h. 8m. p. m. Greenwich, mean time.

Of the nine depressions charted, seven are apparently continuations of storms which passed into the Atlantic from the North American continent; two depressions, numbers iii. and ix., developed over the ocean, the former appearing on the 7th, between W. 40° and 45°, and the latter off the southwest of Ireland at the close of the month. The depressions have moved in a northeasterly direction, four of them reaching the British coast north of the fifty-fifth parallel. From the 1st to the 25th, fresh to strong southwesterly to northwesterly gales with rain or snow prevailed over the north Atlantic; toward the close of the month the weather moderated. Much fog was reported near the Banks. During the first and second decades of the month the atmospheric pressure remained generally low over the region north of 45° north latitude and especially so in the vicinity of the western coast of the British Isles.

The following are brief descriptions of the depressions charted:

I.—This was probably a continuation of an important depression which occupied the Gulf of Saint Lawrence at the close of February, (low area xiv., chart i. for February.) When last observed, on February 29th, the pressure at the centre of disturbance was 28.4 (721.3); moving rapidly north-eastward it passed over Newfoundland on March 1st, and by the 2d, the region of least pressure was near N. 55°, W. 30°, the lowest reported barometer reading 29.43 (747.5.) Strong westerly gales occurred over the region between N. 45° and 50°, during the 2d, with fresh to strong southerly breezes to the eastward of W. 30°. The s. s. "Clintonia," in about N. 48°, W. 40°, on the 1st, had a heavy ssw. gale, increasing to a hurricane and moderating at midnight to a heavy nw. gale. On the 3d, the disturbance was off the northwest coast of Ireland; the winds between W. 20° and 10° and south of N. 50° having changed to the westward.

II.—Was a continuation of the disturbance charted as low area i., chart i., of this REVIEW. During the 2d it moved northeastward along the coast of the United States, and on the 3d it was central east of Nova Scotia, the pressure at the centre being below 29.0 (736.6). The disturbance moved slowly eastward, and during the afternoon of the 4th the high southerly winds, which had prevailed over the region between W. 55° and 45°, shifted to westerly and blew with the force of a strong gale. Captain Moodie, commanding the s. s. "State of Georgia," in about N. 41° 47', W. 55° 21', reported; "at 0 h. 30 m. p. m., Greenwich time, after a short calm the wind came from w. by s. with hurricane force, and continued with unabating force for one and a half hours, after which it veered to nw. and nnw. and began to moderate, lowest barometer (aneroid) 29.26 (743.2). It was almost impossible to do anything about the decks, and so black was the atmosphere that nothing could be seen beyond half a mile from the ship." Captain Stokes, commanding the s. s. "Belgenland," in N. 39° 49', W. 55° 26', reported a very heavy gale on the 4th, with hail and rain squalls and lightning, wind veering gradually from w. to nw. The steamers "Weser," H. Bruns commanding, in

N. 42° 07', W. 53° 42', and "Venetian," W. H. Trant commanding, in N. 41° 56', W. 48° 22', reported, on the 4th, first, moderate southerly winds, with heavy rain and lightning, then shifting during the afternoon to strong westerly gales, with high sea. During the day the disturbance continued its north-easterly movement, and on the 5th it was apparently central near N. 51°, W. 32°. Captain Cochrane, commanding the s. s. "The Queen," in about N. 46° 26', W. 39° 58', on the 4th, reported: "at 10 a. m., of the 4th wind backed to southward and increased to a fresh gale; at 10 p. m., blowing a furious gale, with fierce squalls, thunder and lightning and very heavy rain, barometer 29.28 (743.7); the wind then shifted to nw. and settled into a strong gale, which continued until midnight of the 5th; the barometer began to rise rapidly at noon of the 5th." On the 6th the storm-centre was near the fifty-fifth parallel and between W. 20° and 15°, the pressure having increased to 29.8 (756.9). This depression was followed by a rapid increase of pressure, which caused steep gradients over the region south of N. 50° and west of W. 25°, where heavy westerly and northwesterly gales prevailed. During the 7th the disturbance passed northeastward over the British Isles.

III.—On the 6th the atmospheric pressure over the ocean, between N. 40° and 50°, and W. 40° and 50°, ranged from 30.4 (772.1) to 30.6 (777.2); during the day a rapid decrease of pressure appears to have occurred, since, by the 7th, the barometric readings over the above-mentioned region ranged from 29.8 (756.9) to 30.2 (767.1), and the winds, which had backed to sw., blew with the force of a heavy gale. Captain De Jouselin, commanding the s. s. "Saint Laurent," in about N. 46° 40', W. 39° 55', on the 7th reported: "at 2.28 a. m. the barometer, which read 30.16 (766.1), began to fall rapidly, and four hours later it read 29.82 (757.4); the wind shifted from nw. to sw., and from 6.30 a. m. to 11.30 a. m. it blew with hurricane force; at 3 p. m. it shifted to nw. and decreased, the barometer rising rapidly." The ship "Armenia," E. L. Carter commanding, in N. 44° 35', W. 44° 30', had barometer 29.81 (757.1), (a fall of .42 inch since the observation of the 6th) wind w., force 7, overcast. Captain Jæger, commanding the s. s. "Nürnberg," in N. 45° 35', W. 40° 28', reported barometer 29.89 (759.2), being a decrease of about .25 inch, wind sw., force 8, hail-squalls, and very heavy sea. By the morning of the 8th the storm-centre was near W. 20°, and to the north of the fiftieth parallel, the lowest pressure reported being 29.6 (751.8). Strong westerly to northwesterly gales, with rain, snow and sleet, prevailed near N. 50°, and between W. 30° and 15°; east of W. 15° the winds were southerly. By the 9th the disturbance was near the British coasts, attended by moderate gales and decreasing pressure. From the 9th to the 17th the pressure remained low near the western coasts of the British Isles, causing southerly winds and rainy weather over those islands.

IV.—This was a continuation of low area iii., of chart i. It passed into the Atlantic from the coast of Virginia during the 9th; and moved northeastward to Nova Scotia on the 10th, and by the 11th it was central on the Banks of Newfoundland. At the same time a large and deep depression occupied the ocean north of N. 50°, and east of W. 35°, and the two depressions, apparently combining, formed an extensive area of low pressures which extended from the Banks eastward to the British coasts; to the westward of W. 55°, a steep barometric gradient existed, so that moderate to heavy northwesterly gales prevailed in that region. The following reports indicate the presence of this depression:

Captain Le Gallais, commanding the s. s. "Grecian," between N. 44° 27', W. 44° 12', and N. 46° 11', W. 39° 40', reported: "11th, barometer falling slowly and westerly wind increasing until 5 a. m. of the 12th, when the barometer read 28.88 (733.5), wind shifted to nw., blowing a hurricane with very high sea; at 7 a. m. the barometer began to rise, but the gale did not moderate until 4 a. m. of the 13th, when the wind hauled to n."

Captain P. d'Hauterive commanding the s. s. "France," re-



ported: during the 11th and 12th (N.  $44^{\circ} 40'$ , W.  $36^{\circ} 40'$ , to N.  $46^{\circ} 36'$ , W.  $29^{\circ} 44'$ ), threatening weather, variable winds from sw. to w., and very high sea; heavy rain during the night; at noon of the 12th the wind and sea increased, barometer falling. From the 12th to the 15th, the region of least pressure was between W.  $30^{\circ}$  and  $25^{\circ}$ , and near the fiftieth parallel; the storm-centre apparently moved slowly eastward, then southward, and finally resumed its northeasterly movement on the 15th. This period was characterized by a succession of strong variable gales, with fierce hail and rain-squalls, and pressure ranging from 28.6 (726.4) to 29.1 (739.1).

Captain Malet, commanding the s. s. "Marengo," reported: "on the 12th, in about N.  $44^{\circ} 50'$ , W.  $29^{\circ} 58'$ , 1 a. m., barometer (aneroid) 29.19 (741.4); 1.30 a. m., sudden shift of wind to westward, heavy rain; barometer 29.22 (742.2); 2 a. m., wind sw. by s., force 6; light rain, high, confused sea; 6 a. m., brisk w. gale, violent squalls, with hail, barometer 29.07 (738.4), falling; 3 p. m., barometer 28.9 (734.0), falling, very high sea, from w. and wsw.; 6 p. m., wind decreasing, weather squally, with rain and hail; 13th, 3 a. m., barometer 28.83 (732.3), wind wsw.; noon, moderate wsw. gale, barometer rising."

Captain Barends, commanding the s. s. "Silesia," reported: "in N.  $46^{\circ} 31'$ , W.  $35^{\circ} 29'$ , on the 12th, the wind increased to a hurricane from nw. to nnw., with violent snow and hail squalls in quick succession; foam and sea blown completely over the ship, the sea carrying away several articles from the deck. The gale lasted twenty hours, barometer ranging from 28.7 (729.0) to 29.4 (746.7)."

Captain Urquhart, commanding the s. s. "Lord Clive," reported "13th, in N.  $48^{\circ} 50'$ , W.  $27^{\circ} 30'$ , barometer 28.4 (721.3), and did not rise above 29.0 (736.6) until the 14th and then only for about eight hours; at 4 p. m. it was 28.7 (729.0) again; on the 15th, in N.  $45^{\circ} 27'$ , W.  $37^{\circ} 10'$ , the wind hauled to n. and the barometer rose above 29.0 (736.6)."

The s. s. "Virginian," M. Fitt commanding, in N.  $46^{\circ} 41'$ , W.  $35^{\circ} 30'$ , encountered a heavy nnw. gale with squalls of hurricane force and high confused sea, lasting from noon of the 12th until 9 p. m.

Captain Bence, commanding the s. s. "Baltic," reported: "14th, in N.  $47^{\circ} 26'$ , W.  $33^{\circ} 16'$ , 4 p. m., Greenwich time, barometer (aneroid) 28.77 (730.7), with a strong gale from wnw., varying to wsw. and high w. sea; ran into light baffling winds, and the temperature rose from  $52^{\circ}$  to  $60^{\circ}$ , with heavy leaden clouds rising in the nne. quarter; 4.30 p. m. wind shifted to n., increasing to a strong gale with terrific rain squalls and very high confused sea; weather remained threatening throughout the day, accompanied by heavy rain squalls" (ship's position on the 15th, N.  $47^{\circ} 55'$ , W.  $28^{\circ} 37'$ ).

The s. s. "Helvetia," J. W. Rogers, commanding, in N.  $46^{\circ} 45'$ , W.  $29^{\circ} 0'$ , on the 14th, had barometer 28.8 (731.5); wind s. by w., force 5, cloudy.

Captain Gleadell, commanding the s. s. "Celtic," reported: "15th, in N.  $48^{\circ} 34'$ , W.  $27^{\circ} 44'$ , noon, barometer 28.97 (735.3), falling, strong nw. breeze and threatening appearance; 2 p. m., whole gale hauling to nnw., high, confused sea; 4 p. m., barometer 28.93 (734.8), stationary; gale at its height, afterwards gradually moderating, with rising barometer. During the 16th and 17th the disturbance remained at some distance west of the British coasts, but appeared to be losing its energy and filling up.

V.—This was a continuation of a depression charted as low area vi on chart i. It passed off the Carolina coast on the 14th and moved northeastward, causing gales of hurricane force during that and the following day, as reported by the s. s. "Valencia," S. Hess commanding, and the brig "Teneriffe," N. S. Tracy commanding. On the 15th the storm-centre was off the coast of Nova Scotia; during the 16th and 17th it moved northeastward attended by moderate to strong southwest to northwest gales in its southern semi-circle, and by the 18th the depression occupied the ocean to the northwest of the British Isles. On the 17th in N.  $47^{\circ} 52'$ , W.  $31^{\circ} 56'$ , Captain Norvell, commanding the s. s. "British Crown," reported barometer

29.29 (744.0), wind wsw, force 8, high sea, misty. On the 19th Captain Spicer, commanding the ship "Stephen D. Horton," in N.  $51^{\circ} 01'$ , W.  $15^{\circ} 30'$ , reported: "11 a. m. wind sw. fresh gale, suddenly shifting to nw. and blowing with terrific force for two hours." On the same date the s. s. "Circassian," Lieutenant W. H. Smith, R. N. R., commanding, reported: "at 4.30 p. m., Greenwich mean time, in N.  $53^{\circ} 55'$ , W.  $14^{\circ} 50'$ , sudden shift of wind from ssw. to w. and blew for about two hours with force 10."

VI.—This was a continuation of a depression which passed over the maritime provinces on the 17th, and is traced on chart i. as low area viii. On the 18th the centre was over the entrance to the Gulf of Saint Lawrence; during the 19th and 20th it moved northeastward, passing beyond the range of observation on the last mentioned date. The passage of the disturbance is indicated by the report of Captain Park, commanding the s. s. "Scandinavian." During the 19th and 20th that vessel was between N.  $44^{\circ} 38'$ , W.  $43^{\circ} 53'$  and N.  $47^{\circ} 5'$ , W.  $38^{\circ} 10'$ , and reported: "a. m. of 19th clear weather but murky appearance of stars; 8.20 a. m., clouds moving from wsw., wind se., increasing to a strong gale, barometer falling steadily; 1.30 p. m., heavy rain with thunder and lightning, wind veering to sw. by w., barometer 29.73 (755.1); 3 p. m., barometer, 29.76 (755.9) moderate wind, overcast; midnight, barometer, 29.58 (751.3) wind sw., force 7; 20th, 3 a. m., squally, with rain; from 4 p. m. to 6 p. m., barometer 29.47 (748.5), squally; the barometer then began to rise and the weather improved."

VII. This depression, prior to the 20th, is traced as low area vii. on chart i. At midnight of that date the centre was southeast of Nova Scotia with strong southerly winds to the eastward; on the 21st the region of least pressure was shown near N.  $45^{\circ}$ , W.  $50^{\circ}$ , where the barometer read 29.5 (749.3). During the day the depression passed northeastward. Captain Pfeiffer, commanding the s. s. "Habsburg," reported: "21st, 11 a. m. in N.  $44^{\circ} 25'$ , W.  $42^{\circ} 48'$ , barometer 29.99 (761.7), wind ssw., force 4, heavy looking sky in sw. and very high n. swell, wind increasing to whole gale; 4 p. m., barometer 29.53 (750.0), wind ssw., force 9, heavy rain; 7 p. m., wind sw., increasing to force 10, very heavy and dangerous sea, lowest barometer 29.22 (741.9); 10 p. m., wind decreasing and barometer rising, 29.30 (744.2); from 10 p. m. to 3 a. m. of 22d, wind w., varying from force 8 to 10; at 3 a. m., it shifted to nw., force 10, barometer 29.55 (750.6); at 7 a. m., of the 22d, barometer 29.82 (757.4), wind n. force 6, decreasing wind and sea, weather clearing."

Captain Cochrane, commanding the s. s. "The Queen," reported as follows: "21st, 8 a. m., barometer, 30.06 (763.5), increasing sw. wind; noon, in N.  $42^{\circ} 57'$ , W.  $40^{\circ} 50'$ , wind freshening rapidly from sw., with confused sea, barometer steadily falling; 4 p. m., fresh gale and squally; 8 p. m., strong sw. by w. gale, with fierce squalls and very heavy, confused, and dangerous sea from s. sw. and w; midnight, no abatement in the gale, barometer still steadily falling. 22d begins with strong gale and fierce squalls; 6 a. m., during a squall, with heavy rain, the wind shifted to w., barometer immediately rising, lowest reading 29.3 (744.2); position at noon, N.  $45^{\circ} 29'$ , W.  $34^{\circ} 41'$ , wind wnw., strong gale, squally, weather clearing and barometer rising."

The s. s. "State of Georgia," G. Moodie, commanding, in N.  $48^{\circ} 0'$ , W.  $35^{\circ} 12'$ , on the 22d, reported barometer 29.19 (741.4), wind sw. force 9. By the 23d, the disturbance had passed beyond N.  $55^{\circ}$  and was apparently to the westward of the twentieth meridian.

VIII.—This was probably a continuation of low area xi. of chart i. It passed over the maritime provinces on the 29th, and on the 30th and 31st it was in the vicinity of the Banks. This depression did not develop any great storm-energy up to the close of the month.

IX.—This was a deep depression which appeared off the southwestern coast of Ireland at the close of the month, the reports indicating a barometric pressure of 29.1 (739.1) near the centre.

## OCEAN ICE.

Chart ii. also exhibits the southern and eastern limits of icebergs observed in the north Atlantic ocean during the month of March and up to April 12th. This chart is based on reports communicated by shipmasters to this office; reports furnished through the co-operation of the "New York Herald Weather Service," and other data published in the "New York Maritime Register."

During the period from March 8th, to April 12th, the southern limits of the ice region extended to N. 41° 20', while its eastern limits reached W. 40°. The reports show that icebergs were most numerous from N. 42° 30', W. 52° northeastward to N. 44°, W. 43°. During the last decade of the period (April 2-12th) there was a marked diminution in the number of icebergs observed; several steamers arriving at American ports reported that no ice was observed south of N. 42°.

Compared with the chart for the preceding month (February-March) there has been a southerly movement of about 40', but the most decided extension has been eastward, where the limit of the ice region is 3° east of that for the preceding month.

A comparison with the chart for the same period in 1883 shows that the icebergs have drifted much farther to the eastward during the present year, the eastern limit of ice region being about 4° east of that for 1883. The southern limit remained nearly the same in both years.

Icebergs were reported as follows:

8th.—Ship "Wilhelm," in N. 41° 20', W. 54° 06', saw numerous icebergs; s. s. "Saint Laurent," in N. 44° 28', W. 46° 07', passed about four miles south of an iceberg about half a mile long and fifty feet high, also sighted two enormous icebergs to the northward, also at 11.30 p. m. passed an iceberg in N. 43° 53', W. 48° 25'.

9th.—S. S. "Saint Laurent," in N. 43° 30', W. 50° 33', passed a small iceberg; bark "Orpheus," in N. 42° 51', W. 47° 10', passed seven small icebergs ranging from eighty to one hundred and fifty feet high. Ship "Anna," in 44° 11', W. 43° 55', passed a large iceberg about one hundred and twenty feet high.

10th.—S. S. "Donau," between N. 43° 51', W. 44° 51' and 42° 52', W. 48° 49', passed several icebergs; s. s. "Grecian," in 42° 18', W. 49°, passed a large iceberg; also passed two icebergs in N. 42° 30', W. 48° 20'. Bark "Montreal," in N. 43°, W. 50°, passed several icebergs.

11th.—S. S. "France" (Fr.), in N. 43° 07', W. 42° 04', passed an iceberg about sixty-five feet high and nearly a mile long; bark "Orpheus," in N. 42° 50', W. 51° 12', saw several icebergs.

13th.—S. S. "Circassian," in N. 41° 6', W. 49° 25', passed a large iceberg; temperature of the water changing suddenly from 51° to 32°; also, in N. 42° 22', W. 46° 15', passed a large iceberg, temperature of water, 60°. Ship "Anna," in N. 42° 29', W. 48° 46', passed a small iceberg.

15th.—S. S. "Bolivia," in N. 43° 26', W. 42° 49', passed a small iceberg; U. S. steamer "Thetis," in N. 46° 45', W. 47° 31', passed through seventy-five miles of ice; s. s. "Illinois," in N. 42° 58', W. 43° 05', passed a large iceberg fifty or sixty feet high; s. s. "Silesia," between N. 44° 3', W. 45° 30', and N. 43° 32', W. 47° 14', passed several large icebergs; s. s. "Thingvalla," in N. 45° 58', W. 41° 27', passed a large iceberg; s. s. "Canada" (Fr.) passed several icebergs between N. 45° 51', W. 42° 08', and N. 43° 46', W. 46° 43'.

16th.—S. S. "Iowa," in N. 45° 00', W. 41° 30', passed a large iceberg; s. s. "Lord Clive," in N. 44° 00', W. 43° 00', passed a large iceberg.

17th.—S. S. "State of Nebraska," from N. 42° 43', W. 47° 25' to N. 42° 37', W. 49° 35', passed several icebergs and some small pieces of ice; s. s. "Thingvalla," passed several icebergs between N. 43° 40', W. 47° 30' and N. 42° 46', W. 52° 46'; s. s. "Iowa," passed three icebergs in N. 43° 50', W. 44° 44'.

18th.—S. S. "Lord Clive" crossed W. 50° in N. 41° 25' and saw no ice; s. s. "Rhaetia," in N. 42° 23', W. 51° 50', passed

an iceberg about one hundred feet high; s. s. "Iowa" in N. 42° 10', W. 49° 42', saw several icebergs; ship "Columbus," in N. 44° 50', W. 45° 20', passed an ice-field and about twenty large and small icebergs.

19th.—Ship "Columbus," in N. 44°, W. 46°, passed a large iceberg.

22d.—S. S. "Moravia," in N. 43° 34', W. 45° 48', passed an iceberg; s. s. "Amerique," in N. 44° 20', W. 44° 33', passed an iceberg; ship "Columbus," in N. 42° 00', W. 49° 40', passed a large iceberg; s. s. "Habsburg," in N. 43° 38', W. 44° 39', passed three small icebergs.

23d.—S. S. "Lydian Monarch," in N. 43° 35', W. 44° 40', passed an iceberg; s. s. "Sorrento," in N. 41° 45', W. 52° 30', passed a small iceberg; s. s. "Cephalonia," in N. 45° 16', W. 42° 34', passed two icebergs; s. s. "Werra," between N. 43° 57', W. 42° 00', and N. 43° 47', W. 42° 34', passed several icebergs; s. s. "Saint Laurent," in N. 42° 10', W. 50° 25', passed an iceberg.

24th.—S. S. "Lydian Monarch," in N. 41° 48', W. 52° 55', passed an iceberg; ship "Columbus," in N. 41° 30', W. 53° 47', passed a large iceberg.

25th.—S. S. "Eider," in N. 44° 09', W. 40° 27', passed an iceberg bearing nnw., distant fifteen miles; s. s. "Wieland," in N. 44° 12', W. 44° 58', passed an iceberg four hundred feet long and one hundred feet high.

26th.—S. S. "Eider," in N. 42° 57', W. 49° 58', passed several small pieces of ice; also in N. 42° 55', W. 50° 32', an iceberg bearing n., about fifteen miles distant; bark "Erinna," in N. 43° 20', W. 48° 50', passed a large iceberg.

27th.—S. S. "Salerno," in about N. 42° 36', W. 43° 39', passed a very large iceberg together with several small bergs. The large berg appeared to be about a mile long and one mile broad, and the appearance of an island; very dangerous to navigation, especially in thick, hazy weather.

28th.—S. S. "Ontario," in N. 45° 00', W. 40° 15', passed an iceberg.

29th.—Ship "E. W. Stetson," in N. 42° 05', W. 53° 20', passed one large and two small icebergs.

April 2d.—S. S. "Tower Hill," at New York, reported having passed large numbers of icebergs between N. 44° 50', W. 47° 26', and N. 43° 23' W. 51°; s. s. "Somerset," in N. 45° 24', W. 43° 34', passed a large iceberg.

April 11th.—S. S. "Labrador," in N. 43° 11', W. 52° 22', passed a large iceberg.

April 13th.—S. S. "Bristol," at New York, crossed W. 50° in latitude 42°, and saw no ice; s. s. "Llandaff City," at New York, reported: "saw no ice south of N. 42°."

## TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature of the United States and Canada for March, 1884, is exhibited on chart iii. by the dotted isothermal lines.

The following are some of the highest and lowest monthly mean temperatures reported from the Signal Service stations:

Stations reporting highest.		Stations reporting lowest.	
Key West, Florida.....	74.7	Pike's Peak, Colorado.....	4.9
Rio Grande City, Texas.....	72.2	Saint Vincent, Minnesota.....	10.7
Brownsville, Texas.....	69.6	Mount Washington, New Hampshire.....	12.2
Sanford, Florida.....	68.4	Moorhead, Minnesota.....	14.7
Jacksonville, Florida.....	66.3	Fort Buford, Dakota.....	19.6
Indianola, Texas.....	65.7	Bismarck, Dakota.....	19.7
Galveston, Texas.....	64.8	Escanaba, Michigan.....	21.1
New Orleans, Louisiana.....	64.8	Duluth, Minnesota.....	22.1
Pensacola, Florida.....	63.1	Marquette, Michigan.....	22.7
Mobile, Alabama.....	62.2	Mackinaw City, Michigan.....	23.0
Savannah, Georgia.....	61.7	Huron, Dakota.....	25.7

In the following table are shown the normal temperatures for March, the mean temperatures for March, 1884, and the departure from the normal, in the several geographical districts, as deduced from the records of the Signal Service:



Average temperatures for March, 1884.

Districts.	Average for March. Signal-Service ob- servations.		Comparison of March, 1884, with the average for several years.
	For sev- eral years.	For 1884.	
New England.....	33.9	33.9	normal.
Middle Atlantic states.....	40.8	41.5	0.7 above.
South Atlantic states.....	54.4	57.0	2.6 above.
Florida peninsula.....	68.2	69.3	1.0 above.
Eastern Gulf states.....	58.2	59.6	1.4 above.
Western Gulf states.....	59.4	60.2	0.8 above.
Rio Grande valley.....	70.0	70.9	0.9 above.
Tennessee.....	50.5	51.4	0.9 above.
Ohio valley.....	42.2	43.4	1.2 above.
Lower lake region.....	31.8	31.3	0.5 below.
Upper lake region.....	27.3	26.1	1.2 below.
Extreme northwest.....	20.4	17.4	3.0 below.
Upper Mississippi valley.....	37.2	36.6	0.6 below.
Missouri valley.....	33.8	33.4	0.4 below.
Northern slope.....	33.3	28.3	5.0 below.
Middle slope.....	42.7	42.1	0.6 below.
Southern slope.....	56.9	56.7	0.2 below.
Southern plateau.....	53.3	50.3	3.0 below.
North Pacific coast region.....	44.3	42.1	2.2 below.
Middle Pacific coast region.....	46.3	44.5	1.8 below.
South Pacific coast region.....	54.4	52.8	1.6 below.
Mount Washington, N. H.....	58.7	57.4	1.3 below.
Pike's Peak, Colo.....	11.1	12.2	1.1 above.
Salt Lake City, Utah.....	8.1	4.9	3.2 below.
	40.6	40.0	normal.

From the above table it is shown that at Salt Lake City, Utah, and in New England the mean temperature of the month did not differ from the normal. In the Ohio and Rio Grande valleys, Tennessee, Florida, middle and south Atlantic, and Gulf states, the mean temperature of the month was above the normal. In the middle Atlantic and western Gulf states, Rio Grande valley, and Tennessee, the departures were less than 1°; in the Ohio valley and eastern Gulf states they were 1°2 and 1°4, respectively; and in Florida and the south Atlantic states, they varied from 1°0 to 2°6. In the lake region, extreme northwest, upper Mississippi and Missouri valleys, Rocky mountain regions, (except at Salt Lake City), and in the Pacific coast districts, the month was colder than the average. The greatest departure below the normal, 5°, occurred in the northern slope. On the Pacific coast the departures varied from 1°3 in southern California, to 1°8 in Oregon and Washington Territory; in the extreme northwest and southern plateau, they were 3°; in the lower lake region, upper Mississippi and Missouri valleys, and middle and southern slopes, they varied from 0°2 to 0°6.

## DEVIATIONS FROM MEAN TEMPERATURE.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average temperatures for March, 1884. The following notes in connection with this subject are reported by voluntary observers:

**Arkansas.**—Lead Hill, Boone county: mean temperature, 48°7, is 1°8 below the March average of the last two years.

**Illinois.**—Anna, Union county: mean temperature, 45°7, is 0°6 below the March average of the last nine years. The highest March mean temperature of that period, 53°7, occurred in 1878; the lowest, 40°9, occurred in 1876.

**Riley, McHenry county:** mean temperature, 29°2, is 0°7 below the March average of the last twenty-three years.

**Mattoon, Coles county:** mean temperature, 41°0, is 2°8 below the March average of the five preceding years.

**Swanwick, Perry county:** mean temperature, 43°4, is 0°5 below the March average of the two preceding years.

**Indiana.**—Wabash, Wabash county: mean temperature, 37°3, is 0°7 below the March average of the last eight years.

**Logansport, Cass county:** mean temperature, 37°6, is 2°3 below the March average of the last twenty-five years. The monthly extremes are: maximum 73°, minimum —4°, which are 0°2 and 14°7 below their respective normals for the period mentioned. The mean temperature of the winter season (from November 1st to March 31st inclusive) of 1883-4, is 31°67, which is 0°14 above the average of the corresponding period of the last twenty-five years.

Table of maximum and minimum temperatures for March, 1884.

State or Territory.	Signal Service.			U. S. Army Post Surgeons, or Voluntary Observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
Alabama.....	Montgomery.....	83	32	Mt. Vernon Bar'ks.....	84	23
Do.....	Mobile.....	84	37	Auburn.....	78.5	25.5
Arizona.....	Willcox.....	76	12	Fort Lowell.....	86	33
Do.....	Fort Apache.....	66	15			
Arkansas.....	Fort Smith.....	83	24	Lead Hill.....	79	17
Do.....	Little Rock.....	78	28	Fayetteville.....	73	14
California.....	Red Bluff.....	72	32	Angel Island.....	82	43
Do.....	Fort Bidwell.....	60	12	Fort Bidwell.....	63	15
Colorado.....	West Las Animas.....	79	9	Fort Lyon.....	80	9
Do.....	Pike's Peak.....	17	-20	Gunnison.....	43	-18
Connecticut.....	New London.....	60	4	Voluntown.....	64	-3
Do.....	New Haven.....	58	1			
Dakota.....	Fort Bennett.....	71	-11	Fort Sully.....	72	-6
Do.....	Fort Buford.....	59	-23	Webster.....	54	-31
Delaware.....	Del. Breakwater.....	62	15			
District of Columbia.....	Washington City.....	67	13	Rock Creek Bridge.....	70	16
Florida.....	Sanford.....	88	43	Archer.....	93	36
Do.....	Pensacola.....	83	38	Fort Barrancas.....	85	34
Georgia.....	Savannah.....	83	34	Quitman.....	83	41
Do.....	Atlanta.....	70	24	Milledgeville.....	79	21
Idaho.....	Coeur d'Alene.....	80	0	Fort Lapwai.....	64	19
Do.....	Lewiston.....	62	24			
Illinois.....	Chicago.....	71	19	Bunker Hill.....	72	5
Do.....	Indianapolis.....	59	-1	Riley.....	64	-10
Indiana.....	Indianapolis.....	70	5	Vevay.....	75	6
Do.....	Indianapolis.....	70	5	La Fayette.....	70	-5
Indian Territory.....	Cantonment.....	79	14			
Iowa.....	Des Moines.....	70	-6	Des Moines.....	72	-8
Do.....	Davenport.....	65	-8	Cresco.....	66	-16
Kansas.....	Dodge City.....	70	6	Manhattan.....	80	10
Do.....	Leavenworth.....	70	11	Allison.....	70	0
Kentucky.....	Louisville.....	75	13	Bowling Green.....	74	6
Louisiana.....	New Orleans.....	80	41	Grand Coteau.....	80	38
Do.....	Shreveport.....	82	33	Liberty Hill.....	77	48
Maine.....	Portland.....	59	3	Cornish.....	56	-4
Do.....	Eastport.....	48	-1	Gardiner.....	48	-19
Maryland.....	Baltimore.....	64	14	Emmitsburg.....	69	9
Do.....	Ocean City.....	60	14	McDonogh.....	62	3
Massachusetts.....	Boston.....	60	4	Somerset.....	69	2
Do.....	Provincetown.....	57	6	Westborough.....	60	3
Michigan.....	Detroit.....	62	3	LaSalle.....	64	-9
Do.....	Marquette.....	53	-27	Fort Brady.....	57	-28
Minnesota.....	Saint Paul.....	60	-12	Chester.....	63	-18
Do.....	Saint Vincent.....	58	-27	Hastings.....	62	-22
Mississippi.....	Vicksburg.....	50	35			
Missouri.....	Saint Louis.....	69	10	Centerville.....	82	6
Do.....	.....	60	-13	Kirkville.....	70	-3
Montana.....	Fort Custer.....	57	-20	Fort Keogh.....	68	-25
Do.....	Fort Assinaboine.....	57	-20	Fort Assinaboine.....	55	-32
Nebraska.....	Omaha.....	67	-3	Red Willow.....	77	0
Do.....	North Platte.....	65	-1	Genoa.....	69	-11
Nevada.....	.....	65	-1	Carson City.....	60	21
New Hampshire.....	Mount Washington.....	42	-26	Contoocook.....	56	-11
New Jersey.....	Sandy Hook.....	64	7	Paterson.....	69	6
Do.....	Atlantic City.....	60	8	Somerville.....	62	3
New Mexico.....	Fort Craig.....	72	20	Fort Union.....	63	9
Do.....	Fort Stanton.....	68	15	Fort Wingate.....	59	11
New York.....	New York City.....	63	5	Fort Columbus.....	62	7
Do.....	Buffalo.....	61	-2	Plattsburg Bar'ks.....	51	-5
North Carolina.....	Scotts Hill.....	81	20	Chapel Hill.....	80	16
Do.....	Wash. Woods.....	72	21	Highlands.....	69	10
Ohio.....	Cincinnati.....	72	14	Cincinnati.....	70	9
Do.....	Cleveland.....	63	-2	Garrettsville.....	62	-10
Oregon.....	Lake View.....	50	15	Albany.....	66	31
Do.....	Roseburg.....	64	28	Fort Klamath.....	56	6
Pennsylvania.....	Pittsburg.....	71	10	Leedsdale.....	66	1
Do.....	Erie.....	64	-1	Franklin.....	60	-10
Rhode Island.....	Narragansett Pier.....	60	4			
Do.....	Point Judith.....	58	6			
South Carolina.....	Charleston.....	81	34	Aiken.....	80	23
Tennessee.....	Chattanooga.....	78	23	Flippin.....	80	.....
Do.....	Knoxville.....	75	14	Andersonville.....	.....	10
Texas.....	Rio Grande City.....	98	32	Fort Concho.....	89	26
Do.....	Fort Elliott.....	80	16	Cleburne.....	84	28
Utah.....	Salt Lake City.....	58	24	Nephi.....	52	18
Vermont.....	.....	.....	.....	Burlington.....	56	-5.3
Do.....	.....	.....	.....	Newport.....	54	-24
Virginia.....	Cape Henry.....	76	22	Marion.....	72	8
Do.....	Fort Myer.....	65	10	Snowville.....	69	9
Washington Territory.....	Olympia.....	64	25	Bainbridge Island.....	66	22
Do.....	Spokane Falls.....	58	12	Pleasant Grove.....	63	3
West Virginia.....	.....	.....	.....	Helvetia.....	68	8
Wisconsin.....	La Crosse.....	66	-10	Evansville.....	68	-15
Do.....	Milwaukee.....	58	-8.5	Wausau.....	58	-25
Wyoming.....	Cheyenne.....	59	2	Fort Fred Steele.....	55	-2

**Vevay, Switzerland county:** mean temperature, 45°01, is 2°81 above the March average of the last twenty years.

**Kansas.**—Yates Centre, Woodson county: mean temperature, 41°8, is 1°4 above the March average of the last four years.

**Wellington, Sumner county:** mean temperature, 41°56, is 2°24 below the March average of the last five years.

**Independence, Montgomery county:** mean temperature, 44°1, is 1°3 below the March average of the last thirteen years.

**Lawrence, Douglas county:** mean temperature, 41°56, is 0°23 below the March average of seventeen years.

**Maine.**—Gardiner, Kennebec county: mean temperature, 27°.8, is 1°.8 below the March average of the last forty-eight years. The mean temperature of the winter season of 1883-'84 is 23°.19, or 0°.56 above the winter average of the last forty-eight years.

**Maryland.**—Fallston, Harford county: mean temperature, 38°.67, is 0°.03 below the March average of the last thirteen years.

**Massachusetts.**—Worcester, Worcester county: mean temperature, 26°.7, is 5°.6 below the March average of the last

forty-five years. The mean temperature of the winter season of 1883-'84 is 28°.2, which is 1°.4 below the winter average of the period above mentioned. The coldest March of the last forty-five years was that of 1856, mean temperature, 22°.9; the warmest March of same period was that of 1871, mean temperature, 40°.

**Missouri.**—Saint Louis: mean temperature, 41°.8, is 1°.6 below the March normal of the last forty-seven years, there being only four cases during that period in which the mean temperature of March was lower.

Table of comparative minimum temperatures for the month of March.

State or Territory.	Minimum for March, 1884, Signal Service.		Minimum since Signal-Service stations were opened—3 to 13 years.			Lowest from any other source.			
	Station.	Temperature.	Station.	Temperature.	Year.	Place.	Temperature.	Year.	Length of record.
Alabama	Mobile	37	Mobile	31	1876	Huntsville	11		9
Do	Montgomery	32	Montgomery	25	1873	Thomas Barracks	18	1876, 1878	3
Arizona	Wilcox	12	Prescott	—8	1876	Fort Canby (old)	—1		12
Do	Fort Apache	15	Fort Apache	11	1881	Fort Apache	—5	1875	8
Arkansas	Little Rock	29	Little Rock	32	1880, 1881	Fort Smith	—3		22
Do	Fort Smith	24	Fort Smith	28	1883	Durham	—2	1876	1
California	Red Bluff	32	Campo	15	1882	Camp Bidwell	0		19
Do	Fort Bidwell	12	Red Bluff	28	1880	Fort Crook	2		12
Colorado	West Las Animas	9	Denver	—10	1880	Fort Lyon	—7		23
Do	Pike's Peak	—20	Pike's Peak	—29	1875	Pagosa Springs	—20	1881	2
Connecticut	New Haven	1	New Haven	6	1875, 1879	Colebrook	—10		12
Do	New London	4	New London	7	1876	New Haven	—9		86
Dakota	Fort Buford	—23	Pembina	—40	1873	Fort Abercrombie	—40	1861, 1869?	19
Do	Fort Sully	—19	Fort Stevenson	—28	1879	Fort Buford	—40	1867	14
Delaware	Delaware Breakwater	15	Delaware Breakwater	25	1880	Fort Delaware	—5		45
District of Columbia	Washington City	13	Washington City	4	1873	Washington City	—5		49
Florida	Pensacola	38	Jacksonville	31	1873, 1879	Fort Barrancas	28		59
Do	Jacksonville	42	Saint Mark's	32	1876	Fort King	27		10
Georgia	Augusta	28	Augusta	23	1873	Fort McPherson	9	1877	7
Do	Atlanta	24	Atlanta	29	1881	Atlanta	—12		0
Idaho	Coeur d'Alene	0	Eagle Rock	—16	1882	Fort Hall	—1		5
Illinois	Bois City	29	Bois City	10	1880	Fort Lapwai	—1		19
Do	Chicago	—1	Chicago	1	1873	Rock Island Arsenal	—14		11
Do	Springfield	7	Champaign	11	1881	Belvidere	—20	1877	5
Indiana	Indianapolis	5	Indianapolis	2	1873	Spiceland	0		14
Do						Kokomo	10	1875	1
Indian Territory	Cantonment	14	Fort Gibson	7	1876	Fort Gibson	7		48
Do			Fort Sill	10	1880	Camp Supply	—2	1876	2
Iowa	Des Moines	—6	Dubuque	—10	1875	Algona	—25		10
Do	Davenport	—8	Davenport	—6	1873	Vale	—20	1880	7
Kansas	Dodge City	6	Dodge City	—8	1889	Fort Riley	—20		21
Do	Leavenworth	11	Leavenworth	2	1876	Fort Leavenworth	—9		52
Kentucky	Louisville	13	Louisville	3	1873	Newport Barracks	3		29
Louisiana	Shreveport	33	Shreveport	26	1876	Fort Jesup	10		23
Do	New Orleans	41	New Orleans	35.5	1876	Baton Rouge	26		58
Maine	Eastport	—1	Eastport	—1	1875, 1880	Gardiner	—20		43
Do	Portland	—3	Portland	1	1875	Brunswick	—19		53
Maryland	Baltimore	14	Baltimore	—5	1873	Fort McHenry	0		53
Massachusetts	Provincetown	6	Springfield	—1.5	1875	Williamstown	—12		63
Do	Boston	4	Boston	2	1875	BillERICA	—14	1875	11
Michigan	Escanaba	—27	Escanaba	—20	1875	Fort Brady	—32	1875	60
Do	Mackinaw City	—20	Marquette	—14	1875	Ontonagon	—22		11
Minnesota	Saint Vincent	—27	Breckenridge	—32	1873	Fort Ripley	—37		18
Do	Moorhead	—23	Saint Paul	—22.5	1873	Fort Snelling	—24		63
Mississippi	Vicksburg	35	Vicksburg	27	1876	Columbus	20		10
Missouri	Saint Louis	10	Saint Louis	8	1873, 1876	Harrisonville	—12		6
Do						Saint Louis	—6		39
Montana	Fort Assiniboine	—26	Fort Benton	—42	1876	Fort Ellis	—36		14
Do	Fort Shaw	—22	Fort Shaw	—18	1882	Fort Benton	—42	1876	12
Nebraska	North Platte	—1	North Platte	—21	1880	Glendale	—20	1880	2
Do	Omaha	—3	Omaha	—7	1880	Bellevue	—15		11
Nevada	Winnemucca	—3	Winnemucca	—3	1882	Camp Halleck	—8	1880	13
New Hampshire	Mount Washington	—26	Mount Washington	—31	1874	Dartmouth College	—23		18
New Jersey	Barneget City	7	Cape May	9	1873	Paterson	0		9
Do	Atlantic City	8	Squan Beach	9	1875	Newark	2		18
New Mexico	Fort Stanton	15	Santa Fe	0	1880	Fort Union	—12	1880, 1882	32
New York	Buffalo	—2	Albany	—4	1875	Madison Barracks	—30		57
Do	Rochester	—2	Oswego	—2.5	1875	Sackett's Harbor	—34		8
North Carolina	Scotts Hill	20	Wilmington	20	1873	Franklin	6	1876	5
Do	Wash Woods	21	Kitty Hawk	20	1876	Fort Johnson	14		58
Ohio	Cleveland	—2	Cleveland	—2	1873	Granville	—14		16
Do	Toledo	3	Toledo	1	1873	New Lisbon	—12		8
Oregon	Linkville	15	Umatilla	11.5	1880	Camp Harney	—3		6
Do	Roseburg	28	Roseburg	19	1880	Fort Klamath	—10	1882	7
Pennsylvania	Erie	—1	Erie	2	1877	Pennsville (near)	—14		6
Do	Pittsburg	10	Pittsburg	2	1873, 1877	Philadelphia	5		123
Rhode Island	Narragansett Pier	4	Newport	9	1879	Fort Adams	—6		44
South Carolina	Charleston	34	Charleston	23	1873	Fort Moultrie	25		38
Do						Charleston	31		105
Tennessee	Knoxville	14	Knoxville	6	1873	Glenwood Cottage	11		11
Do	Chattanooga	23	Nashville	11	1873	Humboldt	—5?	1876	11
Texas	Fort Elliott	10	Fort Elliott	—2	1880	Fort Davis	9		23
Do	El Paso	26	Coleman City	14	1880	Fort Elliott	1	1880	2
Utah	Salt Lake City	24	Salt Lake City	4	1874	Fort Crittenden	—2		3
Vermont			Burlington	—4	1873	Randolph	—27		5
Do						Lunenburg	—23		18
Virginia	Fort Myer	10	Wytheville	—1	1873	Fortress Monroe	13		58
Do	Lynchburg	16	Lynchburg	6	1873	Snowville	9		6
Washington Territory	Spokane Falls	12	Spokane Falls	7	1882	Fort Colville	—20		20
West Virginia			Morgantown	0.5	1873	Weston	2	1876	3
Do						Helvetia	4	1877	5
Wisconsin	La Crosse	—10	La Crosse	—23	1873	Superior City	—24		3
Do	Milwaukee	—8.5	Milwaukee	—3	1877	Fort Crawford	—23		20
Wyoming	Cheyenne	2	Cheyenne	—17	1880	Fort Bridger	—29		20
Do			Fort Washakie	—3.4	1882	Fort Sanders	—28	1875	4



*New Hampshire.*—Contoocook, Merrimac county: mean temperature,  $31^{\circ}.2$ , is  $1^{\circ}.2$  below the March average of the last twelve years.

*New York.*—Palermo, Oswego county: mean temperature,  $26.5$ , is  $1^{\circ}.7$  below the March average of the last thirteen years.

Dannemora, Clinton county: mean temperature,  $26^{\circ}.6$ , corresponds with the March average of the four preceding years. North Volney, Oswego county: mean temperature,  $28^{\circ}.6$ , is  $0^{\circ}.04$  above the March average of the last seventeen years.

*Ohio.*—Wauseon, Fulton county: mean temperature,  $33^{\circ}.1$ , is  $0^{\circ}.3$  above the March average of the last fourteen years. The highest March mean temperature of that period,  $43^{\circ}.2$  occurred in 1878; the lowest,  $26^{\circ}.5$ , occurred in 1877.

*Pennsylvania.*—Dyberry, Wayne county: mean temperature,  $29^{\circ}.5$ , is  $0^{\circ}.2$  above the March average of the last twenty years.

*Texas.*—New Ulm, Austin county: mean temperature,  $63^{\circ}.4$ , is  $0^{\circ}.3$  below the March average of the last twelve years.

*Vermont.*—Woodstock, Windsor county: mean temperature,  $26^{\circ}.7$ , is  $1^{\circ}$  above the March average of the last seventeen years.

*Virginia.*—Wytheville, Wythe county: mean temperature,  $45^{\circ}.2$ , is  $2^{\circ}.4$  above the normal of a period of twenty years.

Variety Mills, Nelson county: mean temperature,  $44^{\circ}.5$ , is  $0^{\circ}.6$  above the average of the last seven years.

*West Virginia.*—Helvetia, Randolph county: mean temperature,  $41^{\circ}.5$ , is  $1^{\circ}.5$  above the March average of the last eight years.

#### MONTHLY RANGES OF TEMPERATURE.

The monthly ranges of temperature were greatest in Dakota, Montana, and Idaho, and least in southern Florida and on the Pacific coast. They varied in extremes from  $24^{\circ}$  at San Francisco, California, to  $82^{\circ}$  at Fort Assinaboine, Montana, and Forts Bennett and Buford, Dakota.

Stations reporting monthly ranges of  $65^{\circ}$  or more are as follows: Fort Assinaboine, Montana, and Forts Bennett and Buford, Dakota,  $82^{\circ}$ ; Cœur d'Alene, Idaho, Huron, Dakota, and Escanaba, Michigan,  $80^{\circ}$ ; Fort Shaw, Montana,  $78^{\circ}$ ; Yankton, Dakota,  $77^{\circ}$ ; Moorhead, Minnesota, La Crosse, Wisconsin, and Des Moines, Iowa,  $76^{\circ}$ ; Bismarck, Dakota, Alpena, Michigan, and Davenport, Iowa,  $73^{\circ}$ ; Saint Paul, Minnesota, Mackinaw City and Marquette, Michigan,  $72^{\circ}$ ; Duluth, Minnesota,  $71^{\circ}$ ; Omaha, Nebraska, Dodge City, Kansas, and West Las Animas, Colorado,  $70^{\circ}$ ; Dubuque, Iowa,  $69^{\circ}$ ; Mount Washington, New Hampshire,  $68^{\circ}$ ; Fort Maginnis, Montana, and Milwaukee, Wisconsin,  $67^{\circ}$ ; North Platte, Nebraska, Cleveland, Ohio, and Rio Grande City, Texas,  $66^{\circ}$ ; Cantonment, Indian Territory, Erie, Pennsylvania, and Saint Vincent, Minnesota,  $65^{\circ}$ .

Monthly ranges of less than  $40^{\circ}$  were reported from the following stations: Roseburg, Oregon, Red Bluff, California, Maricopa and Yuma, Arizona,  $39^{\circ}$ ; Portland, Oregon, Pysht, Washington Territory, and Lewiston, Idaho,  $38^{\circ}$ ; Pike's Peak, Colorado, and Fort Davis, Texas,  $37^{\circ}$ ; Los Angeles, California, Fort Grant, Arizona, and Galveston, Texas,  $36^{\circ}$ ; Port Angeles, Washington Territory, and Salt Lake City Utah,  $34^{\circ}$ ; Sacramento, California,  $32^{\circ}$ ; Boise City, Idaho,  $30^{\circ}$ ; Neah Bay, Washington Territory, and Key West, Florida,  $28^{\circ}$ ; San Francisco, California,  $24^{\circ}$ .

#### GREATEST DAILY RANGES OF TEMPERATURE.

In the several districts the greatest daily ranges of temperature varied as follows:

*New England.*—From  $21^{\circ}$  at Eastport, Maine, and New London, Connecticut, on the 5th and 22d, respectively, to  $33^{\circ}$  at Boston, Massachusetts, on the 30th, and  $36^{\circ}$  on the summit of Mount Washington, New Hampshire, on the 5th.

*Middle Atlantic states.*—From  $20^{\circ}$  at Cape May, New Jersey, on the 30th, to  $31^{\circ}$  at Fort Myer, Virginia, on the 11th.

*South Atlantic states.*—From  $21^{\circ}$  at Charleston, South Carolina, on the 5th, to  $34^{\circ}$  at Kitty Hawk, North Carolina, on same date.

*Florida.*—From  $17^{\circ}$  at Key West on the 14th, to  $29^{\circ}$  at Sanford on the 5th.

*Eastern Gulf states.*—From  $22^{\circ}$  at Pensacola, Florida, on the 29th, to  $30^{\circ}$  at Vicksburg, Mississippi, on the 10th.

*Western Gulf states.*—From  $24^{\circ}$  at Galveston, Texas, on the 1st, to  $40^{\circ}$  at Fort Smith, Arkansas, on the 5th.

*Rio Grande valley.*—From  $36^{\circ}$  at Brownsville, Texas, on the 1st, to  $40^{\circ}$  at Rio Grande City, Texas, on same date.

*Tennessee.*—From  $30^{\circ}$  at Chattanooga on the 10th, to  $34^{\circ}$  at Knoxville on the 16th.

*Ohio valley.*—From  $24^{\circ}$  at Cincinnati and Columbus, Ohio, on the 22d, to  $29^{\circ}$  at Indianapolis, Indiana, and Pittsburg, Pennsylvania, on the 10th and 29th, respectively.

*Lower lake region.*—From  $22^{\circ}$  at Toledo, Ohio, on the 23d, to  $31^{\circ}$  at Rochester, New York, on the 29th.

*Upper lake region.*—From  $24^{\circ}$  at Port Huron, Michigan, on the 13th, to  $39^{\circ}$  at Escanaba, Michigan, on the 2d.

*Extreme northwest.*—From  $35^{\circ}$  at Moorhead, Minnesota, on the 15th, to  $40^{\circ}$  at Bismarck, Dakota, on the 2d.

*Upper Mississippi valley.*—From  $26^{\circ}$  at Saint Louis, Missouri and La Crosse, Wisconsin, on the 11th and 27th, respectively, to  $40^{\circ}$  at Davenport, Iowa, on the 11th.

*Missouri valley.*—From  $34^{\circ}$  at Leavenworth, Kansas, on the 26th, to  $43^{\circ}$  at Huron and Yankton, Dakota, on the 9th, and at Fort Bennett, Dakota, on the 26th.

*Northern slope.*—From  $29^{\circ}$  at Helena, Montana, on the 11th, to  $48^{\circ}$  at Fort Shaw, Montana, on the 7th.

*Middle slope.*—From  $23^{\circ}$  on the summit of Pike's Peak, Colorado, on the 28th, to  $53^{\circ}$  at West Las Animas, Colorado, on the 9th.

*Southern slope.*—From  $38^{\circ}$  at Fort Davis, Texas, on the 9th, to  $48^{\circ}$  at Fort Concho, Texas, on the 4th.

*Southern plateau.*—From  $28^{\circ}$  at Fort Grant, Arizona, on the 28th, to  $45^{\circ}$  at El Paso, Texas, on the 28th and 29th.

*Middle plateau.*— $26^{\circ}$  at Salt Lake City, Utah, on the 3d.

*Northern plateau.*—From  $25^{\circ}$  at Boise City, Idaho, on the 3d to  $32^{\circ}$  at Dayton, Washington Territory on the 29th.

*North Pacific coast region.*—From  $21^{\circ}$  at Fort Canby, Washington Territory, on the 15th, to  $32^{\circ}$  at Roseburg, Oregon and Olympia, Washington Territory, on the 3d and 31st, respectively.

*Middle Pacific coast region.*—From  $16^{\circ}$  at San Francisco, California, on the 1st and 2d, to  $28^{\circ}$  at Red Bluff, California, on the 1st.

*South Pacific coast region.*—From  $20^{\circ}$  at San Diego, California, on the 1st, to  $30^{\circ}$  at Yuma, Arizona, on the 25th.

#### FROSTS.

Frosts occurred in the northern and western districts on the following dates:

*New England.*—1st to 11th, 13th, 15th to 23d, 26th, 28th to 31st.

*Middle Atlantic states.*—1st to 31st.

*Ohio valley.*—1st to 10th, 12th to 17th, 22d, 27th, 28th, 30th, 31st.

*Lower lakes.*—1st to 31st.

*Upper lakes.*—1st to 31st.

*Extreme northwest.*—1st to 31st.

*Upper Mississippi valley.*—1st to 21st, 23d, 24th, 26th, 27th, 29th, 30th.

*Missouri valley.*—1st to 31st.

*Northern slope.*—1st to 31st.

*Middle slope.*—1st to 6th, 8th to 10th, 12th to 15th, 18th, 19th, 22d, 23d, 25th, 26th, 29th, 30th.

*Southern plateau.*—1st, 2d, 7th, 11th to 14th, 16th to 22d, 24th to 30th.

*Middle plateau.*—1st to 4th, 8th to 14th, 16th to 31st.

*Northern plateau.*—1st to 8th, 12th to 14th, 18th, 20th to 25th, 27th to 31st.

*North Pacific coast region.*—1st to 8th, 10th, 12th, 13th, 15th, 20th to 24th, 26th to 31st.

*Middle Pacific coast region.*—3d, 11th, 12th, 19th to 21st, 23d, 24th, 26th to 31st.

*South Pacific coast region.*—11th, 24th, 25th, 27th.

In the Southern states frosts were reported as follows:

*Alabama.*—Green Springs, 2d, 15th; Mobile, 1st; Montgomery, 10th, 16th.

*Arkansas.*—Mount Ida, 2d, 3d, 4th, 9th, 12th, 13th, 15th, 20th; Lead Hill, 3d, 9th, 12th to 15th, 20th; Little Rock, 2d, 9th; Fort Smith, 9th, 15th.

*Florida.*—Newport and Pensacola, 1st; Archer and Lomona, 3d.

*Georgia.*—Augusta, 1st, 2d, 10th; Atlanta, 1st, 10th, 15th; Milledgeville, 10th, 15th; Andersonville, 13th, 14th, 27th.

*North Carolina.*—Weldon, 1st, 16th, 31st; Chapel Hill, 1st, 10th, 16th, 17th; Brevard, 1st to 5th, 10th, 15th, 16th, 17th, 21st, 26th, 30th, 31st; Oglethorpe, 10th, 15th, 16th, 31st; Smithville, 16th, 31st; Fort Macon, 1st, 16th; Hatteras and Wilmington, 1st, 4th; Charlotte, 1st to 5th, 10th, 15th, 16th.

*South Carolina.*—Stateburg, 3d, 10th, 15th, 16th.

*Tennessee.*—Knoxville, 1st, 4th, 10th, 15th, 16th; Chattanooga, 1st to 5th, 10th, 15th, 16th; Memphis, 1st to 11th, 15th; Austin, 15th, 16th, 17th; Milan, 10th, 12th, 15th.

*Texas.*—Cleburne, 2d, 9th; Austin, Clarksville, and Palestine, 9th; Fort Davis, 19th; Fort Stockton, 25th.

On the summit of Mount Washington frosts occurred on the 1st, 3d to 13th, 16th to 20th, 22d to 31st.

The following cases of injury to vegetation by frost have been reported:

*Indianola, Texas.*—The fruit trees and garden vegetables in this vicinity were injured by the cold weather on the 1st.

*Knoxville, Tennessee, 10th.*—The severe weather of the past week caused injury to all kinds of fruit.

#### ICE.

Under the heading "ice in rivers and harbors" the subject of ice formation in the northern section of the country is considered. In the Southern states the following cases of ice formation have been reported:

*Arkansas.*—Lead Hill, 2d to 9th, 12th to 15th.

*North Carolina.*—Charlotte, 1st; Weldon, 31st.

*Texas.*—Indianola, 1st; El Paso, 1st, 28th.

#### PRECIPITATION.

[Expressed in inches and hundredths.]

In the first column of the following table is shown the average precipitation for March in each of the various districts for several years, as determined from observations made at the Signal Service stations; in the second column are given the averages for March, 1884; and the third column shows the excess or deficiency of March, 1884, as compared with the average.

Average precipitation for March, 1884.

Districts.	Average for March. Signal-Service ob- servations.		Comparison of March, 1884, with the av- erage for sev- eral years.
	For sev- eral years.	For 1884.	
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
New England.....	4.45	5.04	0.59 excess.
Middle Atlantic states.....	4.21	6.02	1.81 excess.
South Atlantic states.....	5.26	5.96	0.72 excess.
Florida peninsula.....	3.36	1.67	1.69 deficiency.
Eastern Gulf states.....	6.24	9.03	2.79 excess.
Western Gulf states.....	4.21	4.83	0.62 excess.
Rio Grande valley.....	1.10	0.12	0.98 deficiency.
Tennessee.....	5.97	9.07	3.10 excess.
Ohio valley.....	3.85	3.48	0.37 deficiency.
Lower lake region.....	2.82	2.78	0.04 deficiency.
Upper lake region.....	2.40	2.16	0.24 deficiency.
Extreme northwest.....	1.24	0.69	0.55 deficiency.
Upper Mississippi valley.....	2.45	2.90	0.45 excess.
Missouri valley.....	1.48	2.65	1.17 excess.
Northern slope.....	0.54	1.00	0.46 excess.
Middle slope.....	0.01	1.06	0.45 excess.
Southern slope.....	0.72	0.39	0.33 deficiency.
Southern plateau.....	0.82	3.26	2.44 excess.
Northern plateau.....	1.61	1.94	0.33 excess.
North Pacific coast region.....	5.82	2.40	3.42 deficiency.
Middle Pacific coast region.....	2.98	8.06	5.08 excess.
South Pacific coast region.....	0.84	6.69	5.85 excess.
Mount Washington, N. H.....	6.97	4.16	2.81 deficiency.
Pike's Peak, Colo.....	2.16	0.39	1.77 deficiency.
Salt Lake City, Utah.....	1.96	3.69	4.71 excess.

The distribution of rainfall over the United States and Canada, as determined from the reports from more than six hundred stations, is exhibited on chart iv.

In the lower lake region the precipitation for the month was normal. In the upper lake region, extreme northwest, Florida peninsula, southern slope, Rio Grande and Ohio valleys, deficiencies occurred, ranging from 0.24 to 1.69. The average precipitation in the north Pacific coast region was 2.40, which is considerably less than half of the March average for that district. With these exceptions, the monthly precipitation in the United States was in excess of the average. In California and the southern plateau it was about four times as great as the average for March. Large excesses also occurred in Tennessee, the middle Atlantic and eastern Gulf states. In the Missouri valley the precipitation exceeded the average by 1.17, and in the other districts, where excesses are shown, they were less than 1.00, except at Salt Lake City, Utah, where it amounted to 1.71.

#### DEVIATIONS FROM AVERAGE PRECIPITATION.

The departures exhibited by the reports from the regular Signal Service stations, are shown in the table of average precipitation for March, 1884. Voluntary observers report the following notes in connection with this subject:

*Arkansas.*—Lead Hill, Boone county: monthly precipitation, 3.95, is 0.43 above the March average of the last two years.

*California.*—Fall Brook, San Diego county: monthly precipitation, 10.90, is the heaviest during March for the last eight years.

*Illinois.*—Anna, Union county: monthly precipitation, 4.05, is 0.20 below the March average of the last nine years. The largest March precipitation of that period, 8.82, occurred in 1876; the smallest, 1.99, occurred in 1881.

*Riley, McHenry county:* monthly precipitation, 1.51, is 1.16 below the March average of the last twenty-three years.

*Mattoon, Coles county:* monthly precipitation, 2.75, is 0.97 below the March average of the five preceding years.

*Swanwick, Perry county:* monthly precipitation, 2.75, is 0.86 below the March average of the two preceding years.

*Indiana.*—Wabash, Wabash county: monthly precipitation, 2.05, is 1.01 below the March average of the last eight years.

*Logansport, Cass county:* monthly precipitation, 4.02, is 0.58 above the March average of the last twenty-five years.

*Vevay, Switzerland county:* monthly precipitation, 1.37, is 2.66 below the average of March for a period of twenty years.

*Kansas.*—Yates Centre, Woodson county: monthly precipitation, 1.09, is 0.27 below the March average of the last four years.

*Wellington, Sumner county:* monthly precipitation, 1.02, is 0.20 below the March average of the last five years.

*Independence, Montgomery county:* monthly precipitation, 1.00, is 1.20 below the March average of the last twelve years.

*Lawrence, Douglas county:* monthly precipitation, 2.73, is 0.55 above the March average of a period of seventeen years.

*Maine.*—Gardiner, Kennebec county: monthly precipitation, 5.40, is 1.44 above the March average of a period of forty-eight years.

*Maryland.*—Fallston, Harford county: monthly precipitation, 5.71, is 1.33 above the March average of the last thirteen years. The precipitation for the three months ending March 31, 1884, is 16.88, or 5.36 above the average of the corresponding period of the last thirteen years.

*Massachusetts.*—Worcester, Worcester county: monthly precipitation, 2.37, is 1.15 below the March average of the last forty-five years. The largest March precipitation of that period, 7.71, occurred in 1859; the smallest, 0.23, occurred in 1854.

*Missouri.*—Saint Louis: monthly precipitation, 3.63, is 0.74 below the normal for a period of forty-seven years.

*New Hampshire.*—Contoocook, Merrimac county: monthly precipitation, 4.20, is 0.75 above the March average of the last twenty years.



Table of excessive, and greatest and least monthly precipitation.

Station.	Specially heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration	Amount.	Station.	Amt.
Alabama.					Arizona.	
Mount Vernon Barracks...	7, 8	2.20		14.68	Tucson.....	0.14
Do.....	11, 12, 13	2.84			Pentano.....	0.63
Do.....	17, 18, 19	6.09			California.	
Do.....	22, 23, 24	3.43			Mammoth Tank.....	0.22
Clanton.....				12.75	Indio.....	0.62
Pineapple.....				12.30	Colorado.	
Mobile.....	12, 13	3.87		11.53	Pueblo.....	0.05
Do.....	17, 18	4.50			Fort Lyon.....	0.40
Auburn.....				10.07	Denver.....	0.93
Montgomery.....	12, 13	2.67		9.50	Dakota.	
Do.....	18, 19	2.01			Fort Buford.....	0.10
Do.....	23, 24	3.24			Fort Yates.....	0.23
Green Springs.....	7	2.57		9.17	Bismarck.....	0.60
Tuscaloosa.....				9.02	Fort Totten.....	0.68
Demopolis.....				7.99	Fort A. Lincoln.....	0.72
Arizona.					Fort Sisseton.....	0.82
Fort Grant.....	4	2.08			Fort Sully.....	0.87
California.					Yankton.....	0.92
Emigrant Gap.....				15.18	Florida.	
Cisco.....				14.65	Key West.....	0.16
Los Angeles.....	3, 4, 5	5.73		12.36	Sanford.....	0.94
Do.....	9	2.67			Idaho.	
Colfax.....				12.27	Coeur d'Alene.....	0.85
Knoxville.....				11.72	Indian Territory.	
Fall Brook.....	9, 10	1.71		10.90	Cantonment.....	0.96
Do.....	28, 29	2.05			Kansas.	
San Fernando.....				10.51	Independence.....	1.00
Auburn.....				10.17	Michigan.	
Calistoga.....				9.78	Fort Brady.....	0.69
Newhall.....				9.73	Marquette.....	0.74
Summit.....				9.10	Manistique.....	0.84
Santa Cruz.....				8.76	Minnesota.	
Oakland.....				8.59	Saint Vincent.....	0.38
San Francisco.....	8, 9	3.33		8.24	Chester.....	0.48
Sacramento.....	8, 9	3.44		8.14	Fort Snelling.....	0.86
Martinez.....				7.97	Minneapolis.....	0.95
Benicia Barracks.....	9	2.44		7.93	Montana.	
Ione.....				7.87	Fort Keogh.....	0.30
Angel Island.....	9	3.04		7.82	Fort Shaw.....	0.42
Red Bluff.....	8, 9	2.24		7.81	Fort Assinaboine.....	0.53
Do.....	27, 28	2.00			Fort Maginnis.....	0.56
Hydesville.....	9, 10	1.75		7.03	Helena.....	0.59
Spadra.....				7.00	Fort Ellis.....	0.82
Anaheim.....				6.70	Nebraska.	
Fort Bidwell.....				6.57	Pawnee City.....	0.22
Farmington.....				6.53	Superior.....	0.61
Pleasanton.....				6.53	Stockham.....	1.00
San Mateo.....				6.38	Nevada.	
Suisun.....				6.33	Brown's.....	0.36
San Diego.....	14, 15	1.64		6.23	Humboldt.....	0.39
San Jose.....				6.23	Toano.....	0.68
Monterey.....				6.08	Hawley.....	0.77
Ravenna.....				6.06	Tecona.....	0.93
South Vallejo.....				6.06	Bishop's Creek.....	0.94
Alcatraz Island.....	9	2.33		6.02	Beowawe.....	0.96
Presidio of San Francisco.....	8, 9	2.30			Wadsworth.....	0.97
Weaverville.....	8, 9	1.99			New Mexico.	
College City.....	8, 9	1.92			Puerto de Luna.....	0.05
Delaware.					Fort Craig.....	0.09
Saint George's.....	7, 8, 9	4.40		12.20	Deming.....	0.20
Do.....	19, 20	4.10			Fort Union.....	0.28
Delaware Breakwater.					Fort Stanton.....	0.70
District of Columbia.					Texas.	
Washington City.....	19, 20	2.20		7.24	Brownsville.....	0.07
Distributing Reservoir.....				7.00	Fort Stockton.....	0.12
West Washington.....				6.50	Rio Grande City.....	0.16
Florida.					Fort Davis.....	0.28
Fort Barrancas.....	12, 13	4.20		6.25	El Paso.....	0.33
Pensacola.....	12, 13	4.64			Fort Elliott.....	0.34
Georgia.					Fort Concho.....	0.76
Forsyth.....	12, 13	3.21		11.93	Washington Territory.	
Do.....	22, 23, 24	4.10			Fort Canby.....	0.11
Atlanta.....	7, 8	3.17		9.70	Port Townsend.....	0.42
Do.....	12, 13	2.19			Port Angeles.....	0.42
Do.....	18, 19	2.39			Fort Spokane.....	0.60
Milledgeville.....	13	2.80		8.82	Pleasant Grove.....	0.62
Do.....	24	2.60	6 hours		Bainbridge Island.....	0.97
Andersonville.....	13, 15	4.16		7.52	Wisconsin.	
Do.....	23, 24	2.04			Neillsville.....	0.79
Augusta.....				6.97	Wyoming.	
Quitman.....	13	2.00			Fort Bridger.....	0.38
Illinois.						
Chicago.....	25, 26	3.26	22 hours			
Cairo.....	5	1.91				
Kansas.						
West Leavenworth.....				6.30		
Louisiana.						
Grand Coteau.....	17, 18, 19	5.33		10.20		
New Orleans.....	17, 18	3.45		8.24		
Maryland.						
Woodstock.....				7.65		
Receiving Reservoir.....				6.69		
Baltimore.....				6.37		
Massachusetts.						
Princeton.....				6.91		
Provincetown.....	26	2.14		6.77		
Mississippi.						
Vicksburg.....	17, 18	2.29		8.29		
Missouri.						
Jefferson Barracks.....	24, 25	2.20				
Nebraska.						
Marquette.....				6.04		
New Jersey.						
Vineland.....				6.59		
Atlantic City.....	14, 15	2.07				

Table of excessive, and greatest and least monthly precipitation.—Continued.

Station.	Specially heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration	Amount.	Station.	Amt.
<b>New York.</b>					<b>New York.</b>	
Dannemora.....				8.86	Dannemora.....	8.86
Factoryville.....	9	2.20			Factoryville.....	2.20
<b>North Carolina.</b>					<b>North Carolina.</b>	
Brevard.....	18, 19	7.10		14.53	Brevard.....	7.10
Highlands.....	18, 19	5.50		13.55	Highlands.....	5.50
Statesville.....				12.03	Statesville.....	
Lenoir.....	18	3.00		9.40	Lenoir.....	3.00
Charlotte.....	24, 25	2.42		9.19	Charlotte.....	2.42
Kitty Hawk.....				9.17	Kitty Hawk.....	
Weldon.....				7.06	Weldon.....	
Chapel Hill.....				6.20	Chapel Hill.....	
Wilmington.....	25, 26	3.53		6.07	Wilmington.....	3.53
<b>North Carolina.</b>					<b>North Carolina.</b>	
Halifax.....				7.04	Halifax.....	
<b>Pennsylvania.</b>					<b>Pennsylvania.</b>	
West Chester.....				6.09	West Chester.....	
<b>Rhode Island.</b>					<b>Rhode Island.</b>	
Block Island.....				6.40	Block Island.....	
<b>South Carolina.</b>					<b>South Carolina.</b>	
Alken.....				7.16	Alken.....	
<b>Tennessee.</b>					<b>Tennessee.</b>	
Smithville.....				14.90	Smithville.....	
Knoxville.....	5, 6, 7	4.82		11.93	Knoxville.....	5, 6, 7
Do.....	25	2.32			Do.....	25
Chattanooga.....	5, 6, 7	4.57		10.19	Chattanooga.....	5, 6, 7
Austin.....				8.25	Austin.....	
Ashwood.....				6.10	Ashwood.....	
Fosteria.....	5	3.50			Fosteria.....	5
Kington Springs.....	25	1.67	30 min.		Kington Springs.....	25
<b>Texas.</b>					<b>Texas.</b>	
Cleburne.....	23	2.25		6.25	Cleburne.....	23
Galveston.....	17, 18	3.04			Galveston.....	17, 18
Palestine.....	17	2.21			Palestine.....	17
<b>Virginia.</b>					<b>Virginia.</b>	
Norfolk.....				9.13	Norfolk.....	
Variety Mills.....	25, 26	2.07		8.78	Variety Mills.....	25, 26
Johnsontown.....				8.75	Johnsontown.....	
Lynchburg.....				8.14	Lynchburg.....	
Wytheville.....	19, 20	2.94		8.04	Wytheville.....	19, 20
Chincoteague.....				7.81	Chincoteague.....	
Cape Henry.....				7.65	Cape Henry.....	
Fort Myer.....				7.52	Fort Myer.....	
Marion.....				6.70	Marion.....	
Fort Monroe.....				6.53	Fort Monroe.....	

**New York.**—Palermo, Oswego county: monthly precipitation, 3.23, is 0.33 above the March average of the last thirty-one years.

**North Volney, Oswego county:** monthly precipitation, 3.90, is 0.68 above the average of the last twelve years.

**Dannemora, Clinton county:** monthly precipitation, 8.86, is 5.24 in excess of the March average of the last four years.

**Cooperstown, Otsego county:** monthly precipitation, 4.48, is the largest occurring during March for the last twelve years.

**Ohio.**—Wauseon, Fulton county: monthly precipitation, 2.78, is 0.57 below the March average of the last eleven years. The largest March precipitation of that period, 6.52, occurred in 1876; the smallest, 0.97, occurred in 1872.

**Pennsylvania.**—Dyberry, Wayne county: monthly precipitation, 3.93, is 0.78 above the March average of the last sixteen years. The largest March precipitation of that period, 5.78, occurred in 1871; the smallest, 1.55, occurred in 1883.

**Texas.**—New Ulm, Austin county: monthly precipitation, 4.86, is 0.77 below the March average of the last twelve years. The largest March precipitation of that period, 13.13, occurred in 1883; the smallest 2.25 occurred in 1878.

**Vermont.**—Woodstock, Windsor county: monthly precipitation, 4.48, is 1.29 above the March average of the last fifteen years.

**Virginia.**—Wytheville, Wythe county: monthly precipitation, 8.04, is 4.29 above the March normal of a period of twenty years.

**Variety Mills, Nelson county:** monthly precipitation, 8.78, is 5.32 in excess of the March average of the last five years. The total precipitation for the three months ending March 31, 1884, is 20.39, or 10.04 above the average of the corresponding period of the last five years.

**Washington Territory.**—Bainbridge Island: monthly precipitation, 0.97, is the smallest March precipitation of the last seven years.

**West Virginia.**—Helvetia, Randolph county: monthly precipitation, 4.96, is 0.06 below the average of the last eight years.

Table of rainy and cloudy days, relative humidity, and dew-point for Mar., 1884.

Districts.	† Rainy days.	‡ Cloudy days.	Rel. humidity. °	Dew-point.
			Percentages.	°
New England.....	From 16 to 22	From 8 to 14	From 73.4 to 80.0	From 21.2 to 30.1
Middle Atlantic states.....	15 " 21	7 " 15	65.0 " 84.1	25.5 " 41.4
South Atlantic states.....	11 " 19	5 " 11	65.3 " 79.3	41.2 " 56.2
Florida peninsula.....	5 " 10	1 " 3	72.9 " 73.9	58.6 " 65.2
East Gulf states.....	10 " 15	10 " 12	63.6 " 75.5	45.9 " 55.1
West Gulf states.....	10 " 18	8 " 13	63.1 " 80.0	38.2 " 58.6
Rio Grande valley.....	2 " 9	6 " 13	62.6 " 80.4	56.2 " 62.1
Ohio valley.....	16 " 23	14 " 18	63.4 " 74.7	38.4 " 48.8
Tennessee.....	16 " 19	10 " 15	62.8 " 71.6	38.4 " 40.8
Lower lake region.....	16 " 21	8 " 16	72.1 " 78.9	23.4 " 27.5
Upper lake region.....	10 " 23	6 " 17	67.1 " 79.7	12.9 " 25.2
Extreme northwest.....	5 " 10	4 " 7	78.5 " 85.0	5.8 " 14.9
Upper Mississippi valley.....	11 " 20	7 " 16	63.7 " 73.9	17.8 " 36.7
Missouri valley.....	15 " 17	8 " 11	67.3 " 78.3	19.7 " 39.1
Northern slope.....	6 " 11	4 " 12	49.5 " 81.1	9.6 " 26.5
Middle slope.....	3 " 8	2 " 4	52.8 " 58.9	19.2 " 26.2
Southern slope.....	3 " 7	5 " 9	47.4 " 56.3	33.5 " 38.8
Southern plateau.....	6 " 14	3 " 10	35.8 " 71.9	24.4 " 37.8
Northern plateau.....	9 " 20	7 " 11	68.2 " 78.9	29.6 " 33.4
North Pacific coast region.....	13 " 19	5 " 31	74.1 " 83.2	36.8 " 39.0
Middle Pacific coast region.....	13 " 17	8 " 14	73.0 " 79.9	41.1 " 47.1
South Pacific coast region.....	9 " 21	7 " 11	50.3 " 76.0	3.19 " 48.3
Mt. Washington, N. H.....	Twenty	Six	86.1	8.6
Pike's Peak, Colo.....	Eleven	Eight	75.9	— 0.9
Salt Lake City, Utah.....	Seventeen	Fourteen	58.6	27.0

\* Relative humidity corrected for altitude. † Including all days on which rain or snow fell. ‡ Including all cloudy days—with or without rain or snow.

## SNOW.

Snow fell in the northern and western districts as follows:

*New England.*—2d to 12th, 14th to 17th, 19th to 21st, 28th, 30th, 31st.

*Middle Atlantic states.*—1st to 10th, 14th to 16th, 20th.

*Ohio valley.*—1st to 10th, 14th, 15th.

*Lower lake region.*—1st to 11th, 14th to 21st, 28th to 30th.

*Upper lake region.*—1st to 12th, 14th to 17th, 19th, 20th, 22d, 29th to 31st.

*Extreme northwest.*—1st to 6th, 9th to 12th, 14th, 15th, 18th, 20th to 22d, 27th to 29th, 31st.

*Upper Mississippi valley.*—1st to 12th, 18th to 20th, 30th.

*Missouri valley.*—1st to 14th, 18th to 22d, 31st.

*Northern slope.*—1st to 12th, 18th to 23d, 26th to 31st.

*Middle slope.*—1st to 3d, 5th to 8th, 10th, 11th, 16th to 18th, 20th, 21st, 23d, 24th, 31st.

*Southern plateau.*—15th, 23d, 24th, 26th, 27th, 29th to 31st.

*Middle plateau.*—4th to 12th, 15th, 16th, 18th to 31st.

*Northern plateau.*—5th, 9th to 12th, 15th 19th, 25th to 27th.

*North Pacific coast region.*—5th to 10th, 18th, 19th, 22d, 25th, 27th, 29th.

In the Southern states snow is reported to have fallen as follows:

*Arkansas.*—Lead Hill, 7th, 8th; Fayetteville and Fort Smith, 8th.

*California.*—Hydesville, 27th; Red Bluff, 22d, 28th.

*Georgia.*—Atlanta, 1st, 2d.

*New Mexico.*—Fort Stanton, 23d.

*North Carolina.*—Brevard, Highlands, Lenoir, Ogleeta, and Charlotte, 1st; Wash Woods, 5th.

*Tennessee.*—Milan, 1st, 2d, 17th; Chattanooga and Knoxville, 1st, 2d; Memphis, 4th.

Snow storms of unusual severity, impeding railroad travel, etc., have been reported as follows:

*Huron, Dakota:* the railroads to the eastward were blockaded with snow on the 1st, 2d and 3d.

*Saint Paul, Minnesota:* nearly all trains arriving here on the 2d, were delayed on account of snow drifts. On the 10th, trains on all railroads centering here were delayed from two to eight hours. Snow plows were in general use on the 11th. Delay of trains continued on the 12th and 13th.

*Fort Totten, Dakota:* on the 5th, trains arrived and departed on schedule time, the railroads having been blockaded with snow since February 26th. Railroad traffic was also interrupted by snow blockades from March 10th to 17th.

*Denver, Colorado:* the snow storm of the 5th and 6th, blockaded the Denver and Rio Grande railroad. On the latter date the snow was from three to five feet deep on the range near Cumbres, Conejos county.

*Salt Lake City, Utah:* the snow-storm of the 5th and 6th delayed trains on the Union Pacific railroad for six hours.

*Oswego, New York:* snow fell to a depth of nearly twelve inches on the 9th, causing delay of trains.

*Cedar Rapids, Iowa:* trains on the Milwaukee division of the Burlington, Cedar Rapids and Northern railroad were abandoned on the 10th on account of snow-drifts.

*Eastport, Maine:* a heavy snow-storm occurred on the 10th. The high winds caused the snow to drift to such an extent as to seriously impede travel.

*Portland, Maine:* the snow-storm ending on the morning of the 10th was one of the heaviest of the winter. All railways were badly blockaded and travel seriously impeded.

*La Crosse, Wisconsin:* on the 11th the railroads to the west and north were blockaded with snow.

*Cheyenne, Wyoming:* a violent snow-storm prevailed on the 21st, the snow drifting to a depth of seven feet in this city. Trains on the Union Pacific railroad were delayed.

*Montreal, Province of Quebec, Canada:* on the 21st it was reported that no trains had passed over the Canadian Pacific railroad for eighteen days on account of snow drifts.

*Webster, Day county, Dakota:* the Chicago, Milwaukee and Saint Paul railroad was blockaded with snow nearly the entire month, only one train having arrived between the 1st and 22d.

*Silver Cliff, Custer county, Colorado:* a violent snow storm prevailed on the 24th and 25th; on the latter date the snow was two feet deep on the level.

## LARGEST MONTHLY SNOW-FALLS.

[Expressed in inches and tenths.]

The following are the largest monthly snow-falls reported from the various states and territories during the month:

*California.*—Summit, 91; Emigrant Gap, 64; Cisco, 58; Truckee, 44.5; Boca, 22; Alta, 15; Colfax, 7.5; Weaverville, 5.

*Colorado.*—Gunnison, 21; Fort Collins, 11.5; Denver, 9.3.

*Dakota.*—Webster, 20.6; Fort Pembina, 16.6; Rapid City, 15.5; Deadwood, about 12; Morriston, 9; Bismarck, 5.8.

*District of Columbia.*—Washington City, 5.7.

*Delaware.*—Saint George's, 12.

*Illinois.*—Springfield, 13.8; Mattoon, 7.1; Rockford, 7.1;

*Polo, 6; Bunker Hill, 5.2; Riley, 5.*

*Indiana.*—Indianapolis, 8.8; Logansport, 7.2.

*Iowa.*—Independence, 17.5; Dubuque, about 13; Monticello, 8.1; Muscatine, 7; Fort Madison, 6.7; Cedar Rapids, 6.5; Davenport, 5.3.

*Kentucky.*—Bowling Green, 6.

*Maine.*—Cornish, 27; Gardiner, 23; Orono, 22.5; Eastport, about 15.

*Maryland.*—Fallston, 7.5; Cumberland, 6.

*Massachusetts.*—Provincetown, 17.7; Rowe, 16; Worcester, 15.2; Boston, 15; Westborough, 10.5; Taunton, 10.3; Princeton, 9.4; Milton, 8; Somerset, 6.5; Fall River, 6.

*Michigan.*—Thornville, 9.5; Ionia, 8.2; Grand Haven, 6.2; Swartz Creek, 6.1; Northport, 5.8; Grand Rapids, 5.5; Mottville, 5.5; Manistique, 4.2.

*Minnesota.*—Duluth, 9.4; Chester, 6; Saint Paul, 5.

*Montana.*—Fort Ellis, 8.2; Fort Custer, 7; Helena, 5.9; Fort Maginnis, 5.6; Fort Assinaboine, 5.3.

*Nebraska.*—Omaha, 10.5; Fort Niobrara, 9.4; Red Willow, 6; Genoa, 5.

*Nevada.*—Halleck, 14.5; Elko, 13; Otego, 11; Winnemucca, 11; Wells, 7.5; Toano, 6.5; Golconda, 6.1; Carson City, 5.1; Beowawe, 5; Tecoma, 4.

*New Hampshire.*—Woodstock, 32.2; Ashland, 30.6; Wolfeborough, 28.5; Bristol, 28; Grafton, 28; Lake Village, 27.2; Belmont, 22; Mount Washington, 16.7.

*New Jersey.*—Cape May, about 10; Little Egg Harbor 5.4.

*New York.*—Dannemora, 67.2; Plattsburg Barracks, 25.7; Palermo, 16; Oswego, about 15; Syracuse, about 15; Fort Hamilton, 14.3; Menand station (near Albany), 14.1; Coopers-town, 13.5; Penn Yan, 11.4; Madison Barracks, 9.5; White



Plains, 9; Auburn, 8.5; Ithaca, 8.5; Albany, about 8; Humphrey, 7; Factoryville, 6; Mountainville, 6; Port Jervis, 6.

*North Carolina.*—Ogreeta, 6; Highlands, 5.

*Ohio.*—North Lewisburg, 9; College Hill, 6.5; Jacksonburg, 6; Canal Dover, 5.

*Pennsylvania.*—Troy, 9; Leetsdale, 8.6; Easton, 8.5; Germantown, 8.5; Grampian Hills, 8; Fallsington, 7.8; Catawissa, 7.7; Dyberry, 7; West Chester, 6.5; Haverford College, 6; Drifton, 5.5.

*Tennessee.*—Knoxville, 5.

*Utah.*—Salt Lake City, 32; Kelton, 14; Corrinne, 9.5; Terrace, 8.5; Ogden, 7.9; Nephi, 6.5; Promontory, 6.5.

*Vermont.*—Strafford, 34; Burlington, 33; Lunenburg, 31; Newport, 27.2; Randolph, 27; Woodstock, 25.5; Charlotte, 20; Dorset, 16.5.

*Virginia.*—Accotink, 6.1; Marion, 5.

*Washington Territory.*—Pleasant Grove, 5.

*West Virginia.*—Wellsburg, 4.

*Wisconsin.*—Milwaukee, 17; Sussex, 14.8; Madison, 10.3; Embarrass, 9; Lancaster, 8.2; Beloit, 6.3; Neillsville, 5.9.

#### DEPTH OF UNMELTED SNOW ON GROUND AT END OF MONTH.

[Expressed in inches and tenths.]

*California.*—Hydesville, trace.

*Colorado.*—Pike's Peak, 36; Gunnison, 8; Denver, 0.5.

*Connecticut.*—Bethel, trace.

*Dakota.*—Deadwood, 5.

*Iowa.*—Manchester, in drifts.

*Maine.*—Gardiner, 16; Eastport and Portland, trace.

*Massachusetts.*—Rowe, 24 (2); Milton, 2; Princeton, Somerset, and Westborough, trace.

*Michigan.*—Northport, 12; Manistique, 6; Grand Haven, trace; Traverse City, scattering drifts.

*Minnesota.*—Saint Vincent, 2; Moorhead, trace.

*Montana.*—Fort Maginnis, trace.

*New Hampshire.*—Mount Washington, 36; Grafton, trace.

*New York.*—Dannemora and North Volney, in drifts; Ithaca, Oswego, and Palermo, trace.

*Pennsylvania.*—Dyberry, in drifts.

*Utah.*—Nephi, 1.

*Vermont.*—Strafford, 30; Woodstock, 12; Burlington, 2; Charlotte, in drifts; Dorset, trace.

*Wisconsin.*—Embarrass and Wausau, trace.

*Wyoming.*—Cheyenne, 4.

#### SLEET.

Sleet occurred during March in the various districts, as follows.

*New England.*—6th to 9th, 15th, 19th, 20th, 24th.

*Middle Atlantic states.*—7th to 9th, 13th, 19th.

*South Atlantic states.*—Charlotte, North Carolina, 4th; Atlanta, Georgia, 4th, 5th.

*Western Gulf states.*—Little Rock, Arkansas, 7th, damaging trees and telegraph lines; Fayetteville, Arkansas, 7th; Fort Smith, Arkansas, 8th; Lead Hill, Arkansas, 7th, 8th.

*Tennessee.*—Chattanooga, 4th, 5th; Milan, 5th.

*Ohio valley.*—5th to 10th, 31st.

*Lower lake region.*—8th to 11th, 19th, 20th, 31st.

*Upper lake region.*—Escanaba, Michigan, 11th, 31st.

*Upper Mississippi valley.*—5th, 7th, 8th.

*Missouri valley.*—Fort Scott, Kansas, 7th; Fort Sully, Dakota, 12th; Webster and Morrilton, Dakota, 22d.

*Northern slope.*—4th, 5th, 21st.

*Middle slope.*—Yates Centre, Kansas, 5th; Dodge City, Kansas, 17th.

*Southern plateau.*—Fort Grant, Arizona, 23d.

*Middle plateau.*—Salt Lake City, Utah, 31st.

*Northern plateau.*—Boisé City, Idaho, 7th, 10th, 12th.

#### HAIL.

Dalton, Whitfield county, Georgia: a heavy hail storm occurred at about 7 p. m. of the 7th, the hailstones being as large as hens' eggs.

Nokomis, Montgomery county, Illinois: a violent hail storm occurred in this vicinity on the afternoon of the 11th, the hailstones being of very large size.

Knoxville, Tennessee: at 2.50 p. m. of the 25th a violent rain and hail storm, lasting twenty-six minutes, passed over this city from the west. Hail fell for eighteen minutes, some of the stones measuring three inches in length and one and one-half inches in thickness. They were generally star-shaped, with very rough surface. This storm was followed during the evening by two others, the first occurring at 5.05 p. m., and the second at 9.50 p. m. Both of these were accompanied by hail. Nearly all window-glass of western exposure in the city was broken. During the storm occurring between 5 and 6 p. m. the wind reached a velocity of forty-eight miles. In northern Knoxville four small buildings were blown down and the roofing was blown from several others. The crops and fruit in the tracks of the storms were severely damaged. The widths of the paths of these three storms were one-half mile, three and one-half miles, and three-fourths mile, respectively.

Athens, McMinn county, Tennessee: a severe hail and wind storm occurred on the 25th, causing considerable damage.

Cleveland, Bradley county, Tennessee: one of the most violent hail storms ever known here occurred on the evening of the 25th. All of the hot-houses and skylights in this vicinity were completely ruined by the hailstones, which were of unusual size.

Cartersville, Parker county, Tennessee: a severe hail storm occurred at Rodgers, four miles distant, on the afternoon of the 25th. The hailstones were of very large size, and fell in sufficient quantity to entirely cover the ground.

Nashville, Tennessee: a violent hail storm occurred at 7.50 a. m. of the 25th. Great damage was done to hot-houses and windows. The storm was accompanied by high winds and very heavy rain.

Bremer, Haralson county, Georgia: at 3.30 p. m. of the 25th a heavy fall of hail occurred.

Ogreeta, Cherokee county, North Carolina: a violent hail storm occurred on the 25th, lasting thirty minutes—from 7.30 to 8.00 p. m. The storm passed in a direction from southwest to northeast. The hailstones were very large, some weighing as much as one pound, and fell with such force as to be driven into the earth to a depth of several inches. Much damage was done to vegetation and stock.

Thomson, McDuffie county, Georgia: a violent rain and hail storm passed through this county on the night of the 26th. The hailstones were very large, and in some places covered the ground to a depth of more than two inches. Much fencing and timber were blown down.

Hail storms of less severity than those above mentioned occurred in the several states and territories as follows:

*Arkansas.*—Lead Hill, 11th, 27th.

*Arizona.*—Wickenburg, 26th, 29th, 30th; Prescott, 6th, 10th, 23d, 26th; Forts Grant and McDowell, 6th; Fort Apache, 6th, 16th.

*California.*—Hydesville, 9th, 10th, 22d, 23d; College City, 22d, 24th; Oakland and Angel Island, 25th; Sacramento, 26th; Benicia Barracks and Red Bluff, 27th; San Francisco, 25th, 27th, 28th; Cape Mendocino, 10th, 26th, Fall Brook, 29th.

*Colorado.*—West Las Animas, 27th.

*Dakota.*—Fort Sully, 12th.

*Florida.*—Saint Augustine, 9th.

*Illinois.*—Anna, 6th, 7th, 11th; Mattoon, 28th; Swanwick, 11th, 25th.

*Indiana.*—Wabash, Jeffersonville, Sunman and Indianapolis, 25th; Griffin Station, 7th, 25th.

*Indian Territory.*—Cantonment, 23d.

*Iowa.*—Independence, 27th, 31st; Humboldt, 10th; Ottumwa, 23d, 29th; Keokuk, 25th.

*Kansas.*—Topeka and Wyandotte, 24th; Fort Scott, 24th, 31st; Allison, 10th, 27th; West Leavenworth, 21st; Manhattan, 25th, Maud, 31st, Sherlock, 28th.

*Kentucky.*—Louisville, 25th.

*Louisiana.*—New Orleans, 17th.  
*Maryland.*—Emmitsburg, 8th; Fort McHenry, 14th; Ocean City, 13th, 26th.  
*Massachusetts.*—Westborough and Heath, 8th; Rowe, 8th, 11th; Provincetown, 20th.  
*Michigan.*—Kalamazoo and Northport, 31st.  
*Minnesota.*—Duluth, 22d; Hastings, 30th.  
*Missouri.*—Jefferson Barracks, 7th; Curryville, 24th.  
*Nebraska.*—Crete and Marquette, 21st.  
*Nevada.*—Fort McDermitt, 21st.  
*New Jersey.*—Newark, 8th, 9th, 26th.  
*New Mexico.*—Fort Union, 15th, 23d, 31st.  
*New York.*—Factoryville, 7th; Humphrey, 8th; Oswego and Syracuse, 11th.  
*North Carolina.*—Weldon, 9th; Highlands, 11th; Chapel Hill, Ogleeta, Statesville, Scott's Hill, and Wilmington, 25th; Hatteras and Wash Woods, 29th.  
*Ohio.*—College Hill, 5th, 25th; Jacksonburg, 18th, 25th; Cincinnati, 25th.  
*Oregon.*—Portland, 10th; Astoria, 10th, 19th; Roseburg, 26th.  
*Pennsylvania.*—Dyberry, 9th.  
*Tennessee.*—Ashwood, 19th, 25th; Austin, 25th.  
*Texas.*—Indianola, 12th; Galveston, 13th.  
*Utah.*—Salt Lake City, 5th, 6th; Nephi, 7th, 10th.  
*Virginia.*—Norfolk, 13th; Wytheville, 19th; Variety Mills, 25th; Chincoteague, 26th.  
*Wisconsin.*—Evansville and Sussex, 30th; Manitowoc 31st.  
*Washington Territory.*—Dayton, 12th.

## WINDS.

The most frequent directions of the wind during March, 1884, are shown on chart iii. by arrows flying with the wind. In the Missouri valley, New England, and the middle Atlantic states, they were from north to west; in the south Atlantic and Gulf states, from southeast to southwest; in the lake region and upper Mississippi valley, variable; on the Pacific coast, from west to northwest.

## TOTAL MOVEMENTS OF THE AIR.

[In miles.]

In the following table are given the stations reporting the largest and smallest total movements of the air in each of the various districts:

Districts.	Stations reporting largest.	Miles.	Stations reporting smallest.	Miles.
New England.....	Block Island, R. I.....	11,733	New London, Conn.....	6 139
Middle Atlantic states.....	Delaware Breakwater.....	12,970	Lynchburg, Va.....	3,446
South Atlantic states.....	Fort Macon, N. C.....	11,625	Augusta, Ga.....	3,341
Florida peninsula.....	Key West.....	7,919	Sanford.....	5,451
Eastern Gulf states.....	Pensacola, Fla.....	6,552	Montgomery, Ala.....	5,061
Western Gulf states.....	Indianola, Tex.....	10,737	Little Rock, Ark.....	4,753
Rio Grande valley.....	Brownsville, Tex.....	8,160	Rio Grande City.....	5,838
Tennessee.....	Chattanooga.....	5,766	Memphis.....	4,550
Ohio valley.....	Louisville, Ky.....	6,619	Cincinnati, Ohio.....	4,582
Lower lake region.....	Sandusky, Ohio.....	9,693	Toledo, Ohio.....	5,620
Upper lake region.....	Milwaukee, Wis.....	9,260	Duluth, Minn.....	5,179
Extreme northwest.....	Fort Buford, Dak.....	6,282	Saint Vincent, Minn.....	4,659
Upper Mississippi valley.....	Saint Louis, Mo.....	9,961	Dubuque, Iowa.....	4,132
Missouri valley.....	Leavenworth, Kans.....	6,822	Omaha, Nebr.....	5,819
Northern slope.....	Cheyenne, Wyo.....	9,974	Helena, Mont.....	3,625
Middle slope.....	Dodge City, Kan.....	12,316	Denver, Colo.....	5,732
Southern slope.....	Fort Concho, Tex.....	8,658	Fort Davis, Tex.....	7,064
Southern plateau.....	Fort Apache, Ariz.....	5,336	El Paso, Tex.....	3,981
North Pacific coast region.....	Fort Canby, Wash. T.....	5,710	Olympia, Wash. T.....	1,559
Middle Pacific coast region.....	San Francisco, Cal.....	6,998	Red Bluff, Cal.....	4,974
South Pacific coast region.....	Los Angeles, Cal.....	5,681	Yuma, Ariz.....	4,304

On the summit of Mount Washington, New Hampshire, and Pike's Peak, Colorado, the total movements of the air were 24,525 and 19,128 miles, respectively, the record of the first-named station being incomplete on account of frost work. At Salt Lake City, Utah, the total movement of the air was 4,662 miles.

## HIGH WINDS.

On the summit of Pike's Peak, Colorado, the highest wind velocities were: 72 w., 4th and 9th, and 112 sw., 26th; other dates on which velocities of fifty or more miles per hour were

recorded are as follows: 3d, 5th, 7th, 10th, 11th, 12th, 15th, 21st, 23d, 25th, 26th, 27th, 31st.

At Cape Mendocino, California, the following high velocities were recorded: 72 se., 8th; 92 ne., 9th; 56 se., 13th; 54 se., 14th; 72 se., 27th; the record covered only portions of the month, viz.: from 7th to 17th, 20th, 21st, 22d, and from 27th to 31st.

On the summit of Mount Washington, New Hampshire, the highest wind velocities were 100 nw., 4th; 114 n., 10th; 90 sw., 11th; 122 sw., 12th; 80 nw., 13th; 80 w., 14th; 80 nw., 22d; 85 s., 23d; 82 se., 26th; 88 nw., 30th. Other dates on which velocities of fifty or more miles per hour were recorded are as follows: 3d, 5th, 6th, 7th, 15th, 16th, 17th, 18th, 25th, 29th, 31st.

Other stations reporting velocities of 50 or more miles per hour, are as follows:

Cape May, New Jersey, 60, w., 3d; 52, nw., 10th; 72, nw., 30th; 60, nw., 31st.

Fort Elliott, Texas, 60, s., 10th; 68, sw., 27th.

Sandy Hook, New Jersey, 61, nw., 30th; 52, nw., 31st.

Buffalo, New York, 60, sw., 12th.

Cheyenne, Wyoming, 57, nw., 27th.

Dodge City, Kansas, 56, sw., 10th.

Delaware Breakwater, Delaware, 56, nw., 30th.

Erie, Pennsylvania, 55, s., 11th.

Denver, Colorado, 54, w., 27th.

Cape Henry, Virginia, 52, nw., 31st.

Fort Maginnis, Montana, 52, nw., 10th.

Port Huron, Michigan, 50, w., 12th.

## LOCAL STORMS.

Below are given brief descriptions of the local storms reported from the several states during March, 1884. The most severe storms of this character were those occurring in the Ohio valley and Southern states on the 25th, during the passage of low area xi.:

*Alabama.*—Guntersville, Marshall county: during the night of the 12-13th, a violent storm occurred four or five miles southeast of this place. The course of the storm was slightly north of east, and its path was about one-half mile wide. About thirty buildings were blown down and two persons killed and several injured.

Clayton, Barbour county: a severe storm passed through the northern outskirts of this town on the 25th. Its course was from southwest to northeast, and the path about one-fourth mile in width. Many cabins and out-buildings were destroyed and other damage done.

*Colorado.*—Denver: about fifty buildings in this city were unroofed by the storm of the 27th, entailing losses aggregating about \$15,000. The storm began at 9.30 p. m. and continued until after midnight, the wind reaching a velocity of fifty-four miles per hour from the west.

*Connecticut.*—New Haven: a severe gale occurred on the 30th, causing considerable damage to shipping.

New London: a dangerous off-shore gale prevailed on the 30th. Numerous vessels arrived in disabled condition.

*Delaware.*—Delaware Breakwater: during a gale on the 14th a wind velocity of forty-seven miles was recorded. On the 30th the wind reached a velocity of fifty-six miles from north-west. During this storm the schooner "Riverdale" capsized and drifted seaward; and the schooners "Mattie Holmes," "Annie M. Reynolds," and "Charles H. Hodgdon" went ashore. The sloop "Potosi" was entirely dismasted.

*Georgia.*—Macon, Bibb county: a violent storm passed over the northeastern part of this state on the 25th, destroying many buildings and causing loss of life.

Gainesville, Hall county: at about 2 p. m. of the 25th, a destructive storm passed over this place coming from the southwest, wrecking numerous buildings and levelling trees, etc., in its course. The tornado cloud was cone-shaped and entered Hall county near the confluence of the Chertatee and Chattahoochee rivers.



**Whitesburg, Carroll county:** between 4 and 5 p. m. of the 25th, a tornado passed through the northern suburbs of this town, destroying everything in its path, which was about two hundred and fifty yards in width. The funnel-shaped cloud was seen when from eight to ten miles west, about fifteen minutes before reaching this place. The cloud varied in form during its passage and at times disappeared from view. When distant about three or four miles the whirling motion of the cloud was distinctly observed, and a loud roaring sound was heard. After the passage of the tornado cloud, it was observed that in the centre of the path marked by fallen timbers there was a narrow belt swept clean of leaves and debris. Two persons were killed near Lowell, in this county.

**La Grange, Troup county:** a few minutes before 6 p. m., on the 25th, much attention was attracted by the peculiar and rapid movement of the clouds in the southwest. The clouds were seen flying from every direction toward a given centre, which was a black, boiling mass. As it approached a loud roaring noise was heard. From this place the entire cloud was favorably viewed, as it moved at a velocity not exceeding twelve miles per hour. No damage was done at this place. Three miles west of town some out-houses were blown down and a dwelling was slightly damaged.

**Lumpkin, Stewart county:** a tornado occurred about one mile west of this place on the evening of the 25th, passing in a northeasterly direction and causing great destruction in its path.

**Woodstock, Cherokee county:** a tornado occurred near this place about 1 p. m. of the 25th, the track being about one hundred and fifty yards in width. It passed in a northeasterly direction, blowing down or unroofing all buildings in its path. The tornado cloud was funnel-shaped, and during its passage produced a terrific noise.

**Illinois.—Harrisburg, Saline county:** on the afternoon of the 11th, a tornado passed over this county in a direction from southwest to northeast. Six farm-houses were entirely destroyed and several were unroofed or otherwise damaged. Reports from Whiteside, eighteen miles southwest from Starkville, state that the tornado was very destructive in that vicinity.

**Indiana.—Indianapolis:** between 3 and 4 p. m., of the 25th a severe storm accompanied by hail passed over this city, unroofing houses and blowing down trees. At Brightwood, four miles east, a dwelling was blown down and several persons were injured.

**Seymour, Jackson county:** a destructive storm passed over this place on the afternoon of the 25th. Several houses were unroofed and many trees blown down. The storm passed in a northeasterly direction.

**Richmond, Wayne county:** about 5 p. m. of the 25th, a severe storm passed over this place from the southwest, unroofing several dwellings. At Madison, Jefferson county, the storm caused considerable damage to buildings, and also at Greenfield, Hancock county. It passed within one mile of Connersville, Fayette county, causing much damage to forests in that vicinity.

**Dayton, Tippecanoe county:** a destructive storm occurred at 6 p. m. of the 25th. The greatest damage was done at points south and east of this city.

**Bedford, Lawrence county:** a severe storm of wind and hail occurred on the afternoon of the 25th, causing considerable damage.

**Brookville, Franklin county:** a destructive storm passed through the eastern part of this county between 4 and 5 p. m. of the 25th. Its course was from southwest to northeast, and many buildings and trees in its path were blown down. The village of Scipio, twelve miles east, was almost entirely destroyed.

**Indian Territory.—Fort Reno:** a very heavy storm occurred on the 31st; one building was blown down, and other damage caused by the high wind.

**Kansas.—Wellington, Sumner county:** a heavy gale occurred

on the afternoon of the 27th, upsetting small buildings and blowing down awnings, etc.

**Kentucky.—Lexington, Fayette county:** reports from Colemansville, Harrison county, state that that place was almost entirely destroyed by a tornado on the afternoon of the 25th. The storm passed through the forest south of Falmouth, Pendleton county, where its path was about one-half mile in width.

**London, Laurel county:** a very severe storm occurred in this vicinity at about 4 p. m. of the 25th, destroying numerous buildings and causing loss of life. The damage to property in this county is estimated at \$17,000.

**Boyd, Harrison county:** a very destructive storm passed over this place at about 4 p. m. of the 25th. Many buildings were destroyed and several persons injured.

**Louisiana.—Liberty Hill, Bienville parish:** at 4 p. m. of the 11th a violent storm occurred five miles northwest of this place. Its path was about two hundred yards in width and about one mile in length.

**New Orleans:** a southerly gale occurred during the evening of the 17th, during which the wind reached a velocity of thirty-six miles per hour. Telegraph poles, signs, etc., were blown down, and the steamers "Whisper" and "J. W. Cannon" broke from their moorings, the latter sustaining damage to the extent of \$1,000.

**Massachusetts.—Provincetown:** a severe northwesterly gale prevailed on the 30th. Several vessels were detained in the harbor during the storm. The schooner "W. H. Mailler," went ashore on Peaked Hill Bar.

**Mississippi.—Starkville:** at 3 p. m., of the 11th, a destructive tornado passed within one mile of Starkville, in a direction from southwest to northeast. Buildings were completely demolished and the largest trees were torn up by the roots. The Agricultural and Mechanical college was damaged to the extent of \$10,000. Two persons in this vicinity were killed. The tornado was very destructive at Whitefield, eighteen miles southwest of Starkville. Barns, fencing, etc., on plantations in that locality were destroyed and much stock killed.

**Missouri.—Kansas City:** buildings were unroofed and otherwise damaged by high wind on the evening of the 27th.

**Chillicothe, Livingston county:** between 7 and 8 p. m., of the 27th, a funnel-shaped cloud of inky blackness approached this city. It was accompanied by a loud and roaring noise of very short duration. No damage resulted other than the blowing down of a few light out-buildings.

**New Jersey.—Cape May:** a northwesterly gale occurred on the 30th, during which the wind reached a velocity of seventy-two miles per hour, and for five minutes it blew at the rate of eighty-four miles.

**New York.—Buffalo:** a severe gale occurred on the 12th. At 6.30 p. m. a maximum velocity sixty miles from the west was recorded. A large amount of damage resulted from the storm.

**New York City:** a strong gale occurred on the 30th; maximum wind velocity, thirty-six miles, from the west. Telegraph lines and fencing were blown down, and numerous minor disasters were caused to shipping interests.

**North Carolina.—Ogreeta, Cherokee county:** a tornado occurred about ten miles northwest of this station at 8 p. m. of the 8th, tearing down trees, etc., for a distance of seventy or eighty yards, and then ceasing abruptly, the storm-cloud having apparently lifted from the earth.

**Statesville, Iredell county:** a destructive tornado occurred in this vicinity at 5.30 p. m. of the 25th. It apparently originated a few miles west of Newton, Catawba county, and passed directly eastward until reaching south of Statesville, where its course changed to the northeast and continued in that direction until reaching a point one and one-half miles north of the Western railroad track. Beyond this point no further evidences of the tornado were apparent. On the same afternoon another tornado started at a point west of Elmwood (a few miles south of the track of the tornado above

mentioned), and passed eastward, its path being about three-fourths mile in width. This tornado was accompanied by hail of very large size, some of the hailstones measuring six inches in circumference.

Wilmington: a very heavy rain and thunder storm, accompanied by hail, occurred between 11.15 and 11.50 p. m. of the 25th. Hailstones measuring one inch in diameter were picked up after the storm. From two to three miles south of the city windows were broken, gardens ruined, and small animals killed by the hailstones.

Charlotte: a severe storm passed over this city between 9 and 10 p. m. of the 25th. It passed in an easterly direction and was accompanied by a remarkable electrical display. Very little damage was done in this city, but at points a few miles southwestward, dwellings and trees were blown down. Reports from Newton, Catawba county, state that about thirty houses were blown down during the storm on the night of the 25-26th, and that many persons were injured. The storm is also reported to have been very severe in Iredell county, where great damage was done to buildings and forests. But little damage was done at Charlotte.

Ohio.—Dayton, Montgomery county: the storm of the 25th, was very destructive in this vicinity. It passed in a north-easterly direction, leveling trees and buildings in its course. The path of the storm (about fifty yards in width), was not continuous, the forests showing that in places the storm lifted from the earth. Five buildings were wrecked in this city. At Shakertown, seven miles distant, several houses were blown down, and thirty houses were reported to have been destroyed at Ridgeville.

Ripley, Brown county: many buildings were unroofed by the storm on the evening of the 25th.

Youngstown, Mahoning county: several residences in Poland township, in this county, were demolished by the storm of the 25th. The path of the storm was about ten rods wide and two miles in length.

South Carolina.—Seneca, Oconee county: at 5 p. m., of the 25th, a tornado passed ten miles southeast of this place, destroying much property and causing loss of life. The storm passed within two miles of Pendleton, Anderson county, where buildings were destroyed and several persons injured.

Mr. Jackson Counts, postmaster at Peak, Lexington county, reports that one of the most destructive wind and hailstorms ever experienced in that vicinity occurred between 5 and 6 p. m. of the 25th. People and stock were injured by the falling hailstones, which were unusually large and of a variety of shapes. Several houses were unroofed, and trees and fencing were blown down.

Alston, Fairfield county: a storm passed near this place on the afternoon of the 25th, passing in an easterly direction. Dwellings, out-buildings, and trees were blown down, and at some places the storm was accompanied by hail of large size, which destroyed window-glass and injured the roofs of buildings. At Chester, Chester county, buildings were blown down.

Greenville, Greenville county: on the afternoon of the 25th a severe and destructive storm passed over Anderson and Greenville counties, destroying dwellings and causing other damage. Nearly all of the dwellings at Simpsonville, Greenville county, were blown down, and two persons were killed. During the night of the 25-26th a severe hail storm occurred, causing considerable damage to small grain.

Tennessee.—Chattanooga: on the evening of the 8th a tornado occurred at Whiteside, Marion county, where considerable damage was done. A dwelling was blown down, and one of the inmates killed. Several buildings in that vicinity were partly destroyed. A thunder-storm occurred on the afternoon of the 25th, which was accompanied by a slight fall of hail. No damage resulted in this immediate vicinity, but very destructive hail storms occurred at various points in the state.

Morristown, Hamblen county: on the afternoon of the 25th a tornado, accompanied by hail and heavy rain, visited this

county. Buildings were unroofed, trees uprooted and telegraph lines prostrated.

Nashville: this city and the northern part of Davidson county were visited by a destructive rain and hail-storm on the 25th, which caused a large amount of damage. Between 7 and 8 p. m. a tornado occurred about six miles from this city near the line of the Louisville and Nashville railroad, destroying barns and other buildings and uprooting trees.

Texas.—Fort Elliott: a severe southerly storm occurred on the 10th, the wind reaching a velocity of sixty miles per hour at 4 p. m. Telegraph lines were prostrated and at Mobeetie, a few miles southeast, a building was wrecked. On the 27th, a storm occurred during which a wind velocity of sixty-eight miles from southwest was registered.

El Paso: a severe westerly storm occurred on the 10th which caused considerable damage to roofs, signs, etc.

### NAVIGATION.

In the following table are shown the danger points at the various river stations; the highest and lowest stages for March, 1884, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, March, 1884.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>	<i>Ft. In.</i>		<i>Ft. In.</i>		<i>Ft. In.</i>	<i>Ft. In.</i>
Shreveport, Louisiana.....	29 9	1	31 11	31	18 0	13 11
<i>Arkansas:</i>						
Little Rock, Arkansas.....	33 0	1	12 0	24	7 5	4 7
Fort Smith, Arkansas.....		1	1 0	23	-1 10 <sup>†</sup>	2 10
<i>Missouri:</i>						
Yankton, Dakota †.....	20 0	22	18 0	30	15 2	2 10
Omaha, Nebraska †.....	16 0	24	15 0	20, 21	7 0	8 6
Leavenworth, Kansas.....	21 0	25	10 2	2, 3, 6, 7	5 6	10 8
<i>Mississippi:</i>						
Saint Paul, Minnesota †.....	14 6	31	9 2	24	4 0	5 2
La Crosse, Wisconsin †.....	18 0	29	9 6	27	7 6	2 0
Dubuque, Iowa †.....	21 10	20	12 9	27	11 5	1 4
Davenport, Iowa †.....	15 0	28, 29	11 11	24	9 1	2 10
Keokuk, Iowa †.....	14 6	30, 31	16 8	20	7 9	8 11
Saint Louis, Missouri.....	30 0	28	25 7	10, 11	9 5	16 2
Cairo, Illinois.....	40 0	1	49 7	11	36 2	13 5
Memphis, Tennessee.....	34 0	1, 2, 3	35 1	16, 17	31 3	3 10
Vicksburg, Mississippi.....	41 0	23	49 0	1	45 0	4 0
New Orleans, Louisiana *.....	-2 6	18, 19, 24	+ 0 1	1, 2, 4	-1 5	1 6
<i>Ohio:</i>						
Pittsburg, Pennsylvania.....	20 0	13	18 11	7	3 9	15 2
Cincinnati, Ohio.....	50 0	17	49 8	7	17 11	31 9
Louisville, Kentucky.....	24 0	14	25 10	6, 7	8 6	17 4
<i>Cumberland:</i>						
Nashville, Tennessee.....	43 0	15	49 3	4	13 9	35 6
<i>Tennessee:</i>						
Chattanooga, Tennessee.....	33 0	11	43 0	5	7 11	35 1
Knoxville, Tennessee.....		7	22 4	4	2 4	20 0
<i>Monongahela:</i>						
Pittsburg, Pennsylvania.....	29 0	13	18 11	7	3 9	15 2
<i>Savannah:</i>						
Augusta, Georgia.....		21	26 4	5	7 3	19 1
<i>Willamette:</i>						
Portland, Oregon.....		1	7 1	21	3 5	3 8
<i>Sacramento:</i>						
Red Bluff, California ‡.....	10	15 0		2	2 10	12 2
Sacramento, California.....	15	22 6		3, 4	14 0	8 6
<i>Mobile:</i>						
Mobile, Alabama.....	18	17 4		10	14 0	3 4
<i>Colorado:</i>						
Yuma, Arizona.....	11	27 2		27	17 0	10 2

\* Below high-water mark of 1874 and 1883. † Frozen part of month; see text. ‡ below bench-mark. § No record from 13th to 20th.

### STAGE OF WATER IN RIVERS.

The upper Mississippi river at Saint Paul, Minnesota, was frozen from the 1st to 23d; at La Crosse, Wisconsin, from the 1st to 21st; at Dubuque, Iowa, from the 1st to 24th; at Davenport, Iowa, from the 1st to 23d; and at Keokuk, Iowa, from the 1st to 14th. At Saint Louis, Missouri, it was lowest on the 10th and 11th and highest on the 28th. At stations from Cairo, Illinois, to New Orleans, Louisiana, the daily stages of water are given in the table under "Floods," on page 80.

The Missouri river at Yankton, Dakota, was frozen from the 1st to 20th; and at Omaha, Nebraska, from the 1st to 18th. At Leavenworth, Kansas, it was lowest on the 2d, 3d, 6th, and 7th, and highest on the 25th.

The Ohio river was lowest on the 6th and 7th, and highest from the 13th to 17th. At Cincinnati it rose to within four



inches of the danger-line on the 17th. At Louisville the river rose to the danger-line on the 13th, and reached its highest stage on the 14th, when it was twenty-two inches above the danger-line.

The Red river at Shreveport, Louisiana, was at its highest stage on the 1st, when it was twenty-six inches above the danger-line.

The Cumberland river, at Chattanooga, Tennessee, reached the unusual height of forty-three feet on the 11th, at which time it was ten feet above the danger-line.

#### ICE IN RIVERS AND HARBORS.

*New Haven harbor.*—New Haven, Connecticut: ice in harbor broke up and passed out into Long Island sound on the morning of the 7th. Navigation on the Connecticut river was resumed on the 15th.

*Hudson river.*—Albany, New York: floating ice on the 19th and 20th. Navigation resumed on the 26th.

Menand Station (near Albany, New York): ice began to move on the 17th; river clear of ice on the 21st; first boat of the season arrived at Albany on the 28th.

Poughkeepsie, New York: the steamer "Norwich," with boats in tow, passed this place, bound southward, on the afternoon of the 22d, being the first tow of the season. On this date all ice north of Poughkeepsie was moving downward except that between Hudson and Stockport.

*Shrewsbury river.*—Red Bank, New Jersey: the ice in the river at this place broke up and passed out into the bay on the 19th, causing but little damage, and leaving the river open to navigation.

*Lake Ontario.*—Rochester, New York: the lake was covered with floating ice on the 1st and 2d.

*Lake Erie.*—Cleveland, Ohio: the sloop "Pacific," from Marblehead, Ohio, arrived on the 27th, being the first boat of the season.

Buffalo, New York: the ice in the lake was broken up by the storm of the 12th.

Toledo, Ohio: navigation was resumed on the west end of the lake on the 30th, the first steamer of the season departing on that date.

*Sandusky bay.*—Sandusky, Ohio: the bay was clear of ice on the 18th; on that date the steamer "American Eagle" reported that Lake Erie was clear between Buffalo and Kelley's island, but north of that island there were large quantities of ice. Sandusky harbor was covered with slush-ice on the 19th.

*Niagara river.*—Buffalo, New York: floating ice on the 13th, 25th, 26th, 30th and 31st.

*Oswego river.*—Oswego, New York: floating ice on the 17th; harbor clear of ice on the 20th.

*Detroit river.*—Detroit, Michigan: all ice, except that along the shores, moved out of the river on the 3d; floating ice on the 16th, 17th, 19th, 20th, 21st, 22d, and 25th to 29th; the docks were clear of ice on the 24th.

*Maumee river.*—Toledo, Ohio: ice began to break up on the 16th, and on the 18th, it moved out without causing damage.

*Grand river.*—Lansing, Michigan: ice began to break up on the 19th; river clear of ice on the 21st.

*Black river.*—Port Huron, Michigan: ice went out of the river on the 22d, and navigation for the season was resumed on that date.

*Straits of Mackinac.*—Mackinaw City, Michigan: the steamer "Algomah" arrived at Saint Ignace on the 6th, having been frozen in the straits since January 28th. On the 27th, the ice in the straits was sufficiently strong to permit the crossing of teams.

*Lake Michigan.*—The Signal Service observer at Milwaukee, Wisconsin, reports the following: "lake navigators state that the ice in the lake during March was without precedent. During the first part of the month it was estimated that there were not ten miles of clear water between this port and the opposite shore of the lake, a distance of eighty-five miles. The ice varied in thickness from four to twelve inches, with numer-

ous bergs projecting twenty feet above the water. The propellers "Wisconsin" and "Michigan," of the Grand Haven and Milwaukee line, were ice-bound in Grand Haven harbor from February 22d to March 10th. The westerly gales blew the ice eastward, blocking the harbors on the eastern shore."

Chicago, Illinois: on the 18th the ice in the harbor was sufficiently strong to bear the weight of vehicles. On the 22d the schooner "C. North" arrived from Michigan City, Indiana, being the first boat of the season. The propellers "De Pere," from Manitowoc, and "Monitor," from Michigan City, arrived on the 24th; on that date navigation for the season was fully opened.

Grand Haven, Michigan: the harbor entrance was blockaded with ice on the 3d; on the 4th Grand river froze over. The propellers "Michigan" and "Wisconsin" departed for Milwaukee on the 10th. The steam-barge "J. B. Heath" from Saugatuck, Michigan, arrived on the 27th.

Manistique, Schoolcraft county, Michigan: the lake opened on the 23d; Manistique bay clear of ice on the 26th.

*Mississippi river.*—Saint Paul, Minnesota: the ice began to soften on the 24th. On the 26th, the ice-dam moved out of the harbor and lodged a short distance below; on the 29th, the river became clear of ice.

Hastings, Minnesota: the river opened opposite this place on the 28th.

La Crosse, Wisconsin: the ice broke up at 11.25 a. m. of the 26th and at 1 p. m. of that date the river was clear of ice. Navigation was resumed on the 29th.

Dubuque, Iowa: the ice began to weaken on the 18th; on the 21st the ice was covered with water, and the crossing by teams was abandoned. The ice broke up on the 24th, causing slight damage and forming a dam on the islands below the city. The river was clear of ice on the 30th.

Fort Madison, Iowa: ice broke up on the 15th and 16th; the first boat of the season arrived on the 24th.

Muscataine, Iowa: the ice in the Mississippi broke up during the afternoon of the 24th.

Rock Island, Illinois: the river which had been closed since December 20th, opened on the afternoon of the 22d.

Burlington, Iowa: the ice broke up on the 17th; the first steamer of the season arrived on the 25th.

Davenport, Iowa: ice broke up on the 23d and formed an ice-dam at the foot of Main street. At the islands below the bridge, large blocks of ice were piled up to a height of from forty to fifty feet. During the afternoon the ice-dam gave way and the ice passed out without causing damage. The first steamer of the season arrived on the 24th. Floating ice on the 25th, 26th, and 27th.

Keokuk, Iowa: the ice moved slightly on the 14th; on the 15th, an ice-dam formed below the city; floating ice from 20th to the 23d. First steamer of the season arrived on the 24th.

Saint Louis, Missouri: floating ice on the 2d, 3d, 5th, 6th, and 9th.

*Ohio river.*—Pittsburg, Pennsylvania: floating ice from the 1st to the 6th, 8th, 9th, and 13th.

*Missouri river.*—Fort Buford, Dakota: the ice broke up on the 24th; on the 24th an ice-dam formed five miles below this place. The ice-dam broke on the 26th; floating ice on the 27th, 28th, and 30th.

Bismarck, Dakota: the ice broke on the 26th and formed an ice-dam at Sibley island, causing the water to rise about four feet. The steamers "Beahan" and "Black Hill" were crushed by the ice and sunk on the 27th and 28th, respectively. The ice-dam caused an overflow on the 29th.

Fort Yates, Dakota: the ice broke up on the 27th.

Fort Bennett, Dakota: the ice in the river broke up on the 31st.

Yankton, Dakota: an ice-dam formed in the river on the 21st. Omaha, Nebraska: the new railroad bridge across the Missouri near Blair was badly damaged by an ice-dam on the 22d.

Vermillion, Dakota: the ice began to break up on the 18th; on the 25th the river was free of ice.

Nebraska City, Nebraska: the ice broke up and passed out of the river on the 15th.

*Maquoketa river.*—Monticello, Iowa: the ice went out of the river on the 21st.

Manchester, Iowa: the ice broke up and passed out of the river on the 22d.

*Des Moines river.*—Des Moines, Iowa: the ice broke up on the 19th; floating ice on the 20th and 21st; river clear of ice on the 22d.

Humboldt, Iowa: the ice went out of the river on the 22d.

Ottumwa, Iowa: the ice broke up on the 14th.

*Kansas river.*—Salina, Salina county, Kansas: the ice went out of the river on the 13th.

*Platte river.*—Clear creek, Saunders county, Nebraska: the ice began to break up on the 18th, forming an ice-dam on the 19th; on the 24th the ice-dam gave way, carrying away a part of the railroad bridge. The river was free of ice on the 25th.

*Dakota river.*—Morriston, Dakota: the ice broke up on the 16th.

*Arkansas river.*—Sherlock, Finney county, Kansas: the ice broke up on the 9th.

*Miscellaneous.*—Little Egg Harbor, New Jersey: much ice in the sound from the 1st to the 5th, and on the 7th.

Chicago, Illinois; on the 19th, ice in the Des Plaines river was nineteen inches thick.

#### FLOODS.

In the following table are shown the daily stages of water as observed at the Signal Service stations on the lower Mississippi river during March 1884:

Station .....	Cairo.	Memphis.	Vicksburg.	New Orleans
	ft. in.	ft. in.	ft. in.	ft. in.
Danger-point.....	40 0	34 0	41 0	—2 6
March 1.....	49 4	35 1	45 0	—1 5
2.....	48 5	35 1	45 1	—1 5
3.....	47 6	35 1	45 2	—1 4
4.....	46 3	35 0	45 3	—1 5
5.....	44 10	34 11	45 4	—1 4
6.....	43 2	34 11	45 5	—1 3
7.....	41 2	34 9	45 6	—1 1
8.....	39 5	34 8	45 8	—0 8
9.....	37 10	34 5	45 9	—0 8
10.....	36 7	34 1	45 9	—0 8
11.....	36 2	33 7	45 9	—0 7
12.....	36 7	32 11	45 11	—0 6
13.....	37 7	32 2	45 11	0 0
14.....	38 11	31 8	46 0	0 0
15.....	40 2	31 4	46 0	—0 1
16.....	41 3	31 3	46 0	—0 3
17.....	42 4	31 3	46 1	—0 5
18.....	43 3	31 5	46 7	+0 1
19.....	44 2	31 9	47 4	—0 1
20.....	45 0	31 11	48 1	—0 3
21.....	46 1	32 2	48 6	—0 1
22.....	46 9	32 4	48 10	—0 1
23.....	47 2	32 6	48 10	—0 1
24.....	47 5	32 9	48 11	+0 0
25.....	47 7	33 1	48 11	—0 1
26.....	47 8	33 3	48 10	0 0
27.....	47 10	33 6	48 8	—0 3
28.....	48 1	33 8	48 6	—0 3
29.....	48 5	33 9	48 4	—0 3
30.....	48 7	33 9	48 2	—0 3
31.....	48 3	33 10	47 11	—0 5

\* Below high water mark of 1874 and 1883.

At the beginning of the month the lower Mississippi river was above the danger-line from Cairo, Illinois, southward. At Cairo, the river fell from forty-nine feet, four inches, on the 1st, to thirty-six feet, two inches, on the 11th, and afterwards it rose until the close of the month, at which time it was forty-eight feet, three inches above low water mark.

At Memphis, Tennessee, the river was stationary on the 1st, 2d and 3d, at thirty-five feet, one inch, or thirteen inches above the danger line. It began to fall on the 4th; reached its lowest stage on the 16th and 17th, and afterwards rose steadily until the end of the month when it was within two inches of the danger-line.

At Vicksburg, Mississippi, the river rose uninterruptedly from the 1st to 24th, reaching a point seven feet, eleven inches, above the danger-line on the latter date; it remained sta-

tionary during the 24th and 25th, and afterwards fell slowly until the close of the month, at which time it was forty-seven feet and eleven inches above low-water, or nearly seven feet above the danger-line.

At New Orleans, Louisiana, the month opened with the river at seventeen inches below the highest point reached by the floods of 1874 and 1883. The river was at its highest stage on the 18th, 19th and 24th, when it was one inch above the flood-mark above mentioned. At the close of the month the water had fallen six inches below the highest point reached and was declining slowly.

During the flood of 1883 the water in the Mississippi river in the vicinity of Vicksburg and at points southward did not reach its greatest height during the month of March. In that year, at Vicksburg, the greatest height, forty-three feet ten inches, occurred April 6th; and at New Orleans the high-water mark of 1874 was attained on April 7th and 9th.

In the following table are given the highest stages of March in 1883 and 1884, at Memphis, Vicksburg, and New Orleans:

#### Mississippi River.

Station.	Memphis.		Vicksburg.		New Orleans.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
	Date.	Height.	Date.	Height.	Date.	Height.
March, 1883 ...	5 to 8	35 8	30	19 2	31	43 5
March, 1884 ...	1,2,3	35 1	16,17	31 3	23	49 0
					1	42 3
					18,19,	45 0
					24	31
						—0 10
						1
						—2 11
						1,2,4
						—1 5
Danger-line ...	34 feet.		41 feet.		—2 feet 6 inches.	

\* Below high-water mark of 1874 and 1883.

The following reports relate to the flood of March, 1884, in the lower Mississippi river:

Cairo, Illinois, 31st: the bottom lands in this vicinity continued under water during March. From the 21st until the end of the month, all railroad tracks, leading out of this city, were submerged, with the exception of the Illinois Central. On the 22d, all of the landings on the Kentucky shore of the Ohio river, between Cairo and Paducah, were under water, the lower part of the latter place being inundated to a depth of seven feet.

Memphis, Tennessee: trains on the Memphis and Little Rock railroad, between this city and Madison, Arkansas, were discontinued on the 31st, on account of the overflowed condition of the tracks. Reports from Arkansas City, Arkansas, on the 10th, stated that that place was inundated, and that several warehouses had been washed away. Reports from Trother's landing, Tunica county, Mississippi, on the 10th, stated that the break at that place was about two miles in width, with an average depth of five feet.

Helena, Arkansas: on the 3d the river was within one inch of the high water mark of 1883. On that date many of the inhabitants of the Saint Francis river bottoms moved into the high lands of Lee county. The overflow in Tunica and Coahoma counties, Mississippi, equalled the overflow of last year. On the 4th, the plantations on the Arkansas side of the river, from Arkansas City to Helena, were almost without exception submerged. Reports from Oldtown, on the 5th, stated that the water was rushing through the crevasse at that place with great force, overflowing the country bordering on White river. The river on the 6th was one inch above high water of 1883. On that date the whole country between Lawrenceville and Indian Bay in Monroe county, was under water. The levee protecting a large part of Oldtown, twenty miles below Helena, broke on the 7th, making a crevasse four hundred yards in width. The water swept over the adjacent lowlands carrying away nearly every movable object. On the 20th, reports from Coahoma county, Mississippi, twelve miles below Helena, Arkan-



sas, showed that the river had fallen about three feet below the highest point reached at that place.

Greenville, Washington county, Mississippi: the Mississippi river had declined fourteen inches on the 20th, and the back water on the plantations on the east side of Deer creek began to recede.

Vicksburg, Mississippi: at Lake Providence, in East Carroll parish, Louisiana, a small levee broke on the 6th, flooding a part of the town. A serious break occurred in the Raleigh levee in the lower part of East Carroll parish on the morning of the 9th. On the same date, Klinton, a small village near Vicksburg, was inundated. Reports from Sharkey, Tallahatchie county, Mississippi, stated that on the 12th the water in the Tallahatchie river was within six inches of the high water mark of 1882. On that date, from Sharkey to Greenwood, Le Flore county, a distance of one hundred miles, many of the plantations on both sides of the river were overflowed and the town of Greenwood was almost entirely inundated. Captain Smith, of the steamer "E. C. Carroll," from Sharkey, reported that the condition of this region was much better than during the flood of 1882, and that the planters were of the opinion that the water would recede in time to enable them to pitch their crops. Reports from Satartia, Yazoo county, Mississippi, on 19th, stated that that town was three feet under water. The town of Delta, Louisiana, was overflowed on the 20th. Reports from points westward of that place, on the Vicksburg, Shreveport and Pacific railroad, stated that the road was inundated to a considerable depth between Delta and Tallulah. At California station the road bed was covered to a depth of forty-two inches. At Eagle Bend, Warren county, Mississippi, on the 21st, the water covered everything except a few knolls. Hardtimes and Fairview levees broke on that date, the latter being located about twenty miles below Natchez on the eastern side of the river. On the 22d, the water covered Levee street in many places, flooding the first floors in a number of business houses. The river gauge at noon read one inch higher than the highest stage of 1882. The steamers "R. R. Springer" and "C. D. Shaw" brought a large number of refugees to this city. On the 31st, the river was receding at the rate of three inches per day. On that date, the crevasse at Raleigh landing was four hundred yards in width and about fifteen feet deep. A break in the Alsatia levee was reported to have occurred during the night of the 30th-31st.

Saint Joseph, Tensas parish, Louisiana: the Buck Ridge and Shipp's levees broke at 8 p. m. of the 20th. Point Pleasant and Hewett gaps also broke, causing an overflow in Tensas parish and in the parishes lying southward.

Rodney, Jefferson county, Mississippi: the Kemp levee broke on the night of the 24-25th. On the 25th an appeal was made to the national Congress for aid. On that date it was reported that Tensas parish was entirely submerged and that 20,000 people were destitute.

Natchez, Adams county, Mississippi: on the 15th the river was fifteen inches above high water of 1883. The back-water in Concordia parish, Louisiana, compelled some of the planters to remove stock to high grounds, and many plantations along Black river were overflowed.

Bayou Sara, Louisiana: the Protection levee at Waterloo gave way during the night of the 24th, resulting in the overflow of many of the small farms on False river.

Monroe, Ouachita parish, Louisiana: reports from this place on the 10th, stated that, with the exception of the court-house and a few other buildings, the entire town of Rayville, Richland parish, was under water. A continuous sheet of water extended from Rayville to the Mason hills. From Waverly to Tallulah, in Madison parish, the country was covered with water. Two-thirds of the Vicksburg, Shreveport and Pacific railroad from Delta, Madison parish, to Monroe, were inundated, all of the land in Madison parish south of the railroad being under water.

New Orleans, Louisiana: a crevasse, thirty feet wide, occurred on the 7th in the levee at Live Oak, about two miles

above Thibodeaux, La Fourche parish. On the same date a crevasse occurred in a levee three miles below Algiers, which was reported to have been fifty feet wide and five feet deep. A break occurred at 5 a. m. of the 8th in the levee at Davis' plantation, Saint Charles parish, about nineteen miles above this city. The crevasse was reported to have been thirty-five feet wide and six feet deep. The tracks of the Texas Pacific railway were submerged and displaced. The Morganzia levee, in Pointe Coupee parish, one of the most important embankments in the state, was swept away on the evening of the 14th. This levee protected a large sugar producing district; it was over a mile in length, and was recently constructed at a cost of \$75,000. On this date the river reached the high-water mark of 1874 and 1883. On the 21st there were ten crevasses on the west side of the Mississippi river between New Orleans and Vicksburg, the Morganzia crevasse being nearly a mile wide, with an average depth of ten feet. On that date, twelve parishes, embracing the most productive sections of the state, were more or less inundated. On the night of the 25-26th a break occurred in the levee at the Guidry plantation, in Saint James parish, causing the inundation of a large area of cultivated land. In nineteen miles of levee around Lake Concordia, Concordia parish, there were thirteen crevasses, aggregating many thousand feet. The people along the watercourses abandoned their homes and drove their stock to places of safety. At 10 a. m. of the 29th the upper portion of the old Racourci levee, in Pointe Coupee parish, gave way, and every effort to stop it was without effect. On the 30th the break was over one hundred feet in width and eight feet deep. On that date the water from the Davis crevasse, in Saint Charles parish, on the west bank of the river, which broke March 8th, covered the neighboring plantations and inundated the Texas Pacific and the Louisiana and Texas railroads for a distance of several miles. On the 30th the Davis crevasse was seven hundred feet wide and from thirty to forty feet deep. The Mississippi river at this point fell slightly on the 31st, but the water in the Atchafalaya river continued to rise.

The following reports of floods, occurring in the smaller rivers and streams in the several states and territories during March, have been received.

**Alabama.**—Montgomery: the Alabama river was much swollen on the 13th. The river rose two feet during the six hours ending at 6 p. m., and overflowed its northern banks opposite this city. It continued to rise on the 14th and 15th, and began to fall on the 17th.

Mobile: serious washouts occurred on the Louisville and Nashville railroad on the 26th, owing to heavy rains.

**Arizona.**—Tucson: reports from Florence stated that a "cloud burst" occurred there on the morning of the 7th, flooding the streets to a depth of four feet and causing damaged estimated at \$10,000.

Yuma: several miles of the Southern Pacific railroad track, east of Yuma, were reported to have been washed away on the 10th. During the night of the 11th, the Gila river broke through the levee and flooded the town; many families were compelled to vacate their homes, and numerous buildings were undermined. The river began to fall on the evening of the 12th. On the 15th, a large part of the town was still under water. The damage sustained by the citizens of Yuma is estimated at more than \$250,000.

**California.**—Niles, Alameda county: the heaviest rain storm of the season occurred on the 8th and 9th. The Alameda creek below this place overflowed and flooded the adjacent lowlands.

Livermore, Alameda county: the heaviest fall of rain ever known here occurred on the 8th and 9th, causing the creeks to overflow. The country between Livermore and Pleasanton was submerged, and several bridges were undermined. A small landslide occurred on the railroad near Niles, causing delay of trains.

Pleasanton, Alameda county: the heavy rains preceding the 9th, caused all streams in this locality to rise to unusual heights. Many small bridges were swept away.

**Lathrop, San Joaquin county:** all land west of the San Joaquin river within one-half mile of the river bank was under water on the 14th.

**Stockton, San Joaquin county:** the Calaveras overflowed on the 9th and inundated the plains northeast of this city, causing considerable damage to crops. A washout occurred on the narrow gauge railroad, one and one-half miles west of Wallace.

**San José, Santa Clara county:** the heaviest rain of the season fell during the night of the 8-9th. The Guadalupe and Los Gatos creeks overflowed their banks, both above and below this place, submerging a large area of farming land. Trains on the Southern Pacific railroad were delayed for several hours on account of washouts.

**Los Angeles:** the heavy rains preceding the 8th caused greater damage to the Southern Pacific railroad than the storm of February. The railroad bridge across the Santa Anna river at Colton was washed away. Great damage was also done to the Southern Pacific railroad, north of Los Angeles. The river rose rapidly during the evening of the 9th, overflowing its banks in several places, and causing damage to the extent of several thousand dollars. Numerous buildings were washed away.

**San Francisco:** on the 10th the Colorado division of the Southern Pacific railroad was badly washed, west of Daggett, for a distance of six miles. The breaking of a levee at Robert's Island, near Stockton, San Joaquin county, on the night of the 18-19th, destroyed about 27,000 acres of growing wheat, entailing a loss of \$500,000.

**Connecticut.**—New Haven: on the 26th a massive dam at Beaver lake, eleven miles northwest of this city, gave way, resulting in the destruction of three large manufacturing establishments. The losses sustained are estimated at \$100,000.

**Hartford:** a high stage of water occurred in the Connecticut river on the 28th, flooding many cellars in the city and overflowing the meadows adjacent to the river.

**Dakota.**—Bismarck: the lowlands on both sides of the river were flooded on the 28th.

**Illinois.**—Rockford, Winnebago county: a portion of a mill at New Milford was swept away by high water on the 19th.

**Iowa.**—Cedar Rapids, Linn county: on the 26th the Cedar river reached the highest point known since 1858. Considerable damage was caused by the flooding of cellars, &c.

**Louisiana.**—Shreveport, 4th: on many of the plantations which were recently overflowed, ploughing and other farm work was begun.

**Maine.**—Bangor: the bridge near Hampden, Penobscot county, was swept away during the night of the 28th-29th.

**Massachusetts.**—Worcester, Worcester county: a new reservoir dam at Spencer, in this county, constructed at a cost of \$10,000, gave way on the 27th.

**Lawrence, Essex county:** the high-water in the Merrimac river, on the 28th, flooded the cellars in this city and caused suspension of work in the mills.

**Michigan.**—Port Huron: a freshet occurred in Black river on the 23d. Several boats and rafts of logs were broken from their moorings, and the bridge at this place was carried away.

**Mississippi.**—Yazoo City: on the 16th, all the lowlands in this vicinity were inundated.

**New Hampshire.**—Manchester, Hillsborough county: on the 28th the Merrimac river was higher than it had been since October, 1869.

**Nashua, Hillsborough county:** on the 28th, both the Merrimac and Nashua rivers were higher than they have been for the last four years. The backwater from the Nashua river overflowed cellars and lowlands.

**Concord, Merrimac county:** the Merrimac river was higher on the 28th than has been known for many years. The low lands in this vicinity were completely inundated.

**Henniker, Merrimac county:** the water in the Contoocook river was higher on the 28th than it has been for several years.

**New York.**—Utica: the water in Oriskany creek rose rapidly on the 12th, flooding the village of Oriskany and sweeping away outbuildings and fences. Cellars were filled to overflowing, and in many cases the water covered the lower floors of the houses. On the same day the Mohawk river overflowed, covering the New York Central railroad track to a depth of from two to three feet and causing delay of trains. By midnight of the 12-13th the water had subsided sufficiently to permit trains to pass over the road.

**Buffalo:** the heavy precipitation accompanying the storm of the 12th flooded the southeastern part of the city, the water reaching a greater height than has been known for ten years.

**Pennsylvania.**—Pittsburg: the Alleghany river reached a height of nineteen feet ten inches on the 13th, submerging the tracks of the Pittsburg and Western railroad between Sharpsburg and Alleghany City.

**Rhode Island.**—Providence: the dam of the Newport water-works broke during the night of the 25-26th.

**Tennessee.**—Chattanooga: at 11.30 p. m. of the 7th, the river gauge showed a rise of thirteen feet and eleven inches during the preceding twenty-four hours, and on the 8th it reached the danger line. On the 9th the lower portions of the city were flooded. The river continued to rise on the 10th and 11th, reaching its maximum height, forty-three feet, on the latter date. This stage of water has been exceeded but twice in former years, viz.: fifty-eight feet, March 11th, 1867, and fifty-three feet, eleven inches, March 1st, 1875. Owing to the timely warning of the approaching flood, the damage was comparatively small.

**Nashville:** the Cumberland river, on the 14th, was several inches higher than at any time during the winter, and many families in the low lands were driven from their homes. Numerous small dwellings in the northern part of the city were inundated. Nearly all of the mills along the river were compelled to suspend operations on account of the high stage of water.

**Utah.**—Salt Lake City: at North Fork the Central Pacific trains were delayed for two days previous to the 7th, owing to an overflow of the Humboldt river. The water in Bear river was higher than has been known since 1873. The river rose seven feet in twenty-four hours, washing out all the bridges. Two bridges on the Waldo river were also washed away.

**Virginia.**—Petersburg: the heavy rain on the night of the 25-26th caused the water in the Appomattox river to reach a very high stage. The meadows adjacent to the river were flooded.

**Lynchburg, 26th:** the recent heavy rains in this part of the state caused an overflow in the James river. A portion of the Richmond and Alleghany railroad track was submerged, and several mill-dams were damaged.

**Richmond:** owing to the high stage of water in the James river on the 27th, navigation was temporarily suspended. All of the wharves in the lower part of the city were submerged.

#### HIGH TIDES.

New River Inlet, North Carolina: 26th, 27th.  
Hatteras, North Carolina: 30th.  
Cedar Keys, Florida: 12th.  
Indianola, Texas: 24th.

#### LOW TIDES.

New River Inlet, North Carolina: 3d, 8th, 9th, 17th, 18th, 20th.

#### TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors during March, 1884, with the average depth at which the observations were made and the mean temperature of the air at the various stations, are given in the table below. The highest water temperature of the month, 82° 2, was reported from Key West, Florida; the lowest, 27° 1, from Delaware Breakwater, Delaware. The following are the largest monthly ranges: 27° 0 at Delaware Breakwater; 25° 7 at Cedar Keys, Florida; 21° 3 at Galveston, Texas; 21° at Augusta, Georgia, and Chinc-



teague, Virginia; 20°.3 at Indianola, Texas, and 20°.1 at Norfolk, Virginia. The smallest monthly ranges are: 1°.3 at Eastport, Maine; 2° at San Francisco, California; 5° at Portland, Oregon; 6° at Portland, Maine; 7° at Sandy Hook, New Jersey, and 8° at New London, Connecticut. Observations were not made on account of ice during the month as follows: Grand Haven, Michigan from 4th to 10th; Cleveland, Ohio, from 1st to 22d, 23d to 26th and 31st; Toledo, Ohio, from 1st to 21st; Sandusky, Ohio, from 1st to 19th; Chicago, Illinois from 1st to 23d:

Temperature of water for March, 1884.

Station.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	48.3	32.0	16.3	4 5	38.6
Alpena, Michigan*	66.0	45.0	21.0	17 4	59.6
Augusta, Georgia.....	48.6	35.8	12.8	9 6	44.0
Baltimore, Maryland.....	41.5	29.4	12.1	8 3	36.0
Block Island, Rhode Island.....	40.8	29.9	10.9	22 2	33.5
Boston, Massachusetts.....	51.0	40.7	10.3	16 6	44.0
Canby, Fort, Washington.....	75.0	50.3	25.7	12 2	66.7
Cedar Keys, Florida.....	65.6	52.9	14.7	40 11	59.8
Charleston, South Carolina.....	42.3	38.3	4.0	8 7	34.2
Chicago, Illinois†.....	53.5	32.5	21.0	4 9	42.3
Chincoteague, Virginia.....	38.1	37.4	0.7	14 0	33.6
Cleveland, Ohio.....	54.1	27.1	27.0	8 7	40.1
Detroit, Michigan.....	33.3	32.0	1.3	14 9	28.2
Delaware Breakwater, Delaware.....	71.5	50.3	21.3	12 1	64.8
Duluth, Minnesota.....	44.3	32.1	12.2	19 0	32.0
Eastport, Maine.....	72.8	52.5	20.3	9 5	65.7
Escanaba, Michigan*	73.0	59.0	14.0	18 0	66.3
Galveston, Texas.....	82.2	69.0	13.2	17 7	74.0
Grand Haven, Michigan†.....	64.5	49.0	15.5	2 10	54.8
Indianola, Texas.....	66.0	52.0	14.0	15 1	62.2
Jacksonville, Florida.....	41.6	29.9	11.7	15 3	33.6
Key West, Florida.....	41.8	33.8	8.0	12 2	35.8
Mackinaw City, Michigan*	44.0	31.1	12.9	16 2	37.5
Macon, Fort, North Carolina.....	58.5	38.4	20.1	16 7	50.3
Marquette, Michigan.....	68.1	57.9	10.2	17 6	63.1
Milwaukee, Wisconsin.....	36.4	29.7	6.7	16 2	33.7
Mobile, Alabama.....	49.6	42.7	5.9	35 4	45.4
New Haven, Connecticut.....	41.2	31.5	9.7	10 5	34.0
New London, Connecticut.....	44.0	34.3	9.2	10 10	34.9
New York City.....	41.4	34.2	7.2	1 7	38.0
Norfolk, Virginia.....	55.4	52.7	2.7	39 3	54.0
Pensacola, Florida.....	65.8	48.8	17.0	10 1	61.7
Portland, Maine.....	64.1	49.0	15.1	10 0	56.2
Portland, Oregon.....	48.5	38.6	9.9	12 6	35.2
Provincetown, Massachusetts.....	63.2	47.3	15.9	19 7	58.1
Sandusky, Ohio.....					
Sandy Hook, New Jersey.....					
San Francisco, California.....					
Savannah, Georgia.....					
Smithville, North Carolina.....					
Toledo, Ohio.....					
Wilmington, North Carolina.....					

\* Frozen entire month. † Frozen part of month; see text.

## VERIFICATIONS.

### INDICATIONS.

The detailed comparison of the tri-daily indications for March, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 82.67 per cent. The percentages for the four elements are: weather, 87.26; direction of the wind, 76.51; temperature, 80.56; barometer, 87.94 per cent. By geographical districts they are: for New England, 83.60; middle Atlantic states, 83.48; south Atlantic states, 84.36; eastern Gulf states, 81.42; western Gulf states, 79.73; lower lake region, 84.00; upper lake region, 83.68; Ohio valley and Tennessee, 84.15; upper Mississippi valley, 82.96; Missouri valley, 78.94; north Pacific coast region, 72.37; middle Pacific coast region, 88.16; south Pacific coast region, 92.11. There were five omissions to predict, out of 3,448 or 0.15 per cent. Of the 3,443 predictions that have been made, one hundred and eleven, or 3.22 per cent., are considered to have entirely failed; one hundred and forty-four, or 4.18 per cent., were one-fourth verified; four hundred and fifty-one, or 13.10 per cent., were one-half verified; six hundred and eight, or 17.66 per cent., were three-fourths verified; 2,129, or 61.84 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

## CAUTIONARY SIGNALS.

During March, 1884, two hundred and forty-six cautionary signals were ordered. Of these, two hundred, or 81.30 per cent., were justified by winds of twenty-five miles or more, per hour, at or within one hundred miles of the station. Sixty-two cautionary off-shore signals were displayed, of which number, fifty-four, or 87.09 per cent., were fully justified both as to direction and velocity; sixty-one, or 98.38 per cent., were justified as to direction; and fifty-five, or 88.71 per cent., were justified as to velocity. Three "northwest" signals were displayed on the lakes; all of these were justified both as to direction and velocity. Three hundred and eleven signals of all kinds were displayed, two hundred and fifty-seven, or 82.60 per cent., being fully justified. These do not include signals ordered at display stations, where the velocity of the wind is only estimated. Of the above cautionary off-shore signals, sixty were changed from cautionary; the "northwest" signals were also changed from cautionary. In seventy cases, winds of twenty-five miles or more, per hour, were reported for which no signals were ordered.

The verification of railway signals issued during the month by the "Ohio Meteorological Bureau," Professor T. C. Mendenhall, Director, was as follows:

Temperature, 92 per cent.; precipitation, 88 per cent.

The signals above referred to consist of colored symbols displayed from the sides of the baggage cars on various railroads in Ohio, and represent the daily forecasts as telegraphed from the office of the Chief Signal Officer to said bureau.

## ATMOSPHERIC ELECTRICITY.

### AURORAS.

An auroral display which occurred on the evening of the 28th was observed throughout the northern part of the United States. This was the most extensively observed display of the month, and appears to have been most brilliant from the lake region westward to the Pacific. The display occurring on the evening of the 1st was generally observed in the lake region and New England. On the 25th a display was observed at New River Inlet, North Carolina, which was not reported from any other station. The following reports relate to the display of the 28th:

Provincetown, Massachusetts: auroral display from 10.50 p. m. of the 28th, until midnight, consisting of faint beams reaching nearly to the zenith.

Fall River, Massachusetts: a brilliant auroral display occurred on the 28th, lasting from 8 to 11 p. m. The auroral light extended over about 60° of the northern horizon and beyond the zenith.

New Haven, Connecticut: an auroral arch, extending over about 100° of the northern horizon, was visible in the northern sky at 7.30 p. m. of the 28th. The display was of moderate brilliancy and was obscured by clouds at 10 p. m.

Rochester, New York: aurora from 7.20 to 11 p. m. of the 28th; very bright at 9 p. m., when beams of pale yellow color extended upward 65° from the horizon.

Oswego, New York: aurora at 8.30 p. m. of 28th, consisting of a band of white light which extended from northwest to east. The display reached its maximum brilliancy at 8.55 p. m. and disappeared at 9.30 p. m.

Alpena, Michigan: aurora at 8.15 p. m. of 28th, consisting of a diffuse light with a few pale streamers having an apparent motion from east to west.

Duluth, Minnesota: faint aurora at 9.45 p. m. of the 28th, consisting of flashes of pale green light, at times reaching upward to the zenith.

Escanaba, Michigan: a brilliant auroral display occurred on the 28th. It was first seen at 7.54 p. m. Four minutes later an arch formed near the horizon and gradually moved upward until it reached a point 15° south of the zenith. When the arch reached the zenith, bright, yellow beams, having a swaying motion, shot upward from the northern horizon. The display had entirely faded away at 9.50 p. m.

Bismarck, Dakota: an auroral display, consisting of beams extending from the horizon to the zenith, was observed from 7.30 to 11.30 p. m. of the 28th.

Fort Yates, Dakota: a brilliant auroral display occurred on the evening of the 28th.

Fort Assinaboine, Montana: a partial auroral display was observed from 4.30 until daylight on the morning of the 28th. At 7.40 p. m. of the same date an auroral arch extended from the eastern horizon through the zenith to within 4° of the western horizon. The influence of latter display on the telegraph wires was very perceptible.

Helena, Montana: from 8 to 10.30 p. m. of the 28th were observed bright auroral beams of a variety of tints, and having a tremulous motion.

Saint Vincent, Minnesota: an auroral display was visible from 8 p. m. of the 28th until the early morning of the 29th. Soon after it first appeared, a corona formed at a point south of the zenith, and continued until 11 p. m., when the display assumed the form of an arch.

Dayton, Washington Territory: aurora at 9 p. m. of the 28th, the display being partially obscured by clouds.

Lewiston, Idaho: aurora visible from 7.30 to 9.10 p. m. on the 28th.

Port Angeles, Washington Territory: an aurora was visible in the northern sky at 7.45 p. m. of the 28th. At 8 p. m. there were observed two well-defined segments, between which was a band of straw colored light one and one-half degrees in width. The aurora reached its maximum brilliancy at 10 p. m., when there was a beautiful display of "merry dancers." At 11.20 p. m. the display had become very faint.

Fort Canby, Washington Territory: a brilliant aurora was observed from 9 to 10 p. m. on the 28th. The display consisted of three streamers which extended to an altitude of 60° from a base of bright bluish-pink color.

Other stations reporting the display of the 28th are as follows: Polo, Illinois; Cresco and Manchester, Iowa; Cambridge, Massachusetts; Lansing and Manistique, Michigan; Chester and Northfield, Minnesota; Auburn, Ithaca, Madison Barracks, North Volney, and Palermo, New York; Montreal, Province of Quebec; Toronto, Province of Ontario; Bainbridge Island and Pleasant Grove, Washington Territory; Embarrass, Franklin, Madison, Manitowoc, and Wausau, Wisconsin.

Auroral displays occurred on other dates during the month as follows:

1st.—Sycamore, Illinois; Cresco, Iowa; Cornish, Eastport, Gardiner, Orono, and Portland, Maine; Boston and Cambridge, Massachusetts; Alpena, Escanaba, Lansing, Mackinaw City, Marquette, Manistique, Swartz Creek, Thornville, and Traverse City, Michigan; Johnson, Nebraska; Mount Washington, New Hampshire; Syracuse, Palermo, and Menand Station (near Albany), New York; Leetsdale, Pennsylvania; Block Island, Narragansett Pier and Point Judith, Rhode Island; Burlington, Vermont; Madison, Sussex, and Wausau, Wisconsin.

2d.—Fort Totten, Dakota; Eastport, Gardiner, and Portland, Maine; Boston and Provincetown, Massachusetts; Mount Washington, New Hampshire; Syracuse, New York.

6th.—Marquette, Michigan.

15th.—Sandwich, Illinois.

19th.—Boston, Massachusetts; Mackinaw City, Manistique, and Marquette, Michigan; Manitowoc, Wisconsin; Chatham, New Brunswick and Sidney, Nova Scotia.

20th.—Fort Buford, Dakota; Riley, Illinois; Cornish, Gardiner, and Orono, Maine; Fort Brady, Michigan; Chatham, New Brunswick; Halifax, Nova Scotia; Charlottetown, Prince Edward Island; Burlington and Newport, Vermont; Embarrass and Madison, Wisconsin.

21st.—Eastport and Orono, Maine; Boston, Massachusetts; Fort Brady, Manistique, and Traverse City, Michigan; Chatham, New Brunswick; Sidney, Nova Scotia; Charlottetown, Prince Edward Island; Point Judith, Rhode Island; Burlington and Newport, Vermont.

22d.—Gardiner, Maine; Cambridge, Massachusetts; Newport, Vermont.

24th.—Fort Meade, Dakota: between 7 and 8 p. m., in the northeastern sky.

25th.—New River Inlet, North Carolina: an aurora was observed from 7 to 8 p. m., consisting of a yellowish light, which extended along the horizon from north to northeast and to an altitude of 20°.

27th.—Washington City, District of Columbia: a brilliant aurora was observed at 4 a. m. It consisted of a steady glow of light, of greenish tinge, in the northern sky, extending upward to the zenith.

29th.—Toronto, Province of Ontario.

#### ATMOSPHERIC ELECTRICITY INTERFERING WITH TELEGRAPHIC COMMUNICATION.

Fort Stanton, New Mexico: an intense electrical storm prevailed on the 13th. Between 12 m. and 1.30 p. m. the telegraph wires were so affected as to interrupt communication.

Fort Assinaboine, Montana: telegraphic communication was interrupted by atmospheric electricity on the 26th.

Dodge City, Kansas: 10th, 27th.

Fort Elliott, Texas: during a high southwesterly wind on the 27th the atmosphere was so charged with electricity that the insulated wire, without battery connection, emitted large electric sparks, accompanied by a loud cracking noise.

Cantonment, Indian Territory: the atmosphere was highly charged with electricity on the 31st.

Fort Reno, Indian Territory: during the wind storm of the 27th, the atmospheric electricity was of sufficient intensity to give a severe shock on touching the telegraph wire or binding posts of the instruments.

The observer on the summit of Mount Washington, New Hampshire, reports that on the evening of the 26th, all pointed objects were tipped with light. On holding up the hands slight shocks were experienced. This phenomenon was first noticed at 8.40 p. m., and continued for about one hour, during which time a light snow fell and a dense fog prevailed.

#### THUNDER-STORMS.

Thunder storms were reported in the various districts, as follows:

*New England.*—9th, 21st, 24th, 26th, 28th.

*Middle Atlantic states.*—8th, 9th, 12th, 19th, 25th, 26th, 28th.

*South Atlantic states.*—6th to 9th, 11th to 14th, 18th to 20th, 23d to 26th, 28th, 29th.

*Florida peninsula.*—8th to 14th, 17th to 20th, 22d, 24th to 26th.

*Eastern Gulf states.*—1st, 3d, 6th, 7th, 11th to 13th, 17th to 19th, 23d to 26th.

*Western Gulf states.*—4th to 7th, 11th, 12th, 16th to 18th, 20th to 25th, 27th, 30th, 31st.

*Rio Grande valley.*—Rio Grande City, Texas, 16th to 18th, 20th, 30th 31st.

*Tennessee.*—7th, 8th, 11th, 12th, 19th, 22d, 24th, 25th.

*Ohio valley.*—8th, 11th, 21st, 24th, 25th, 28th.

*Lower lake region.*—10th to 12th, 22d, 25th, 28th.

*Upper lake region.*—2d, 5th, 9th to 11th, 15th, 25th, 28th, 30th, 31st.

*Extreme northwest.*—Fort Buford, Dakota, 25th, 26th.

*Upper Mississippi valley.*—10th, 11th, 21st, 22d, 24th, 25th, 27th, 28th, 30th, 31st.

*Missouri valley.*—10th, 16th, 17th, 19th to 22d, 24th, 25th, 27th, 28th, 30th, 31st.

*Northern slope.*—Cheyenne, Wyoming, 20th; Fort Shaw, Montana, 26th; North Platte, Nebraska, 27th, 30th; Fort Meade, Dakota, 30th.

*Middle slope.*—6th, 9th, 10th, 15th, 16th, 20th to 23d, 27th, 28th, 30th, 31st.

*Southern slope.*—6th, 16th to 18th, 21st to 23d, 30th, 31st.

*Southern plateau.*—6th, 15th, 16th, 26th, 30th.

*Middle plateau.*—Salt Lake City, Utah, 5th, 6th, 10th; Logan, Utah, 6th.



*Northern plateau.*—Boisé City, Idaho, 25th.

*California.*—Los Angeles and Princetown, 4th; Sacramento, 9th; San Francisco and Oakland, 25th.

The following instances of damage by lightning have been reported:

Indianapolis, Indiana: the electrical display accompanying the thunder storm of the 11th was very unusual. A building in this city was damaged by the lightning and several persons were stunned.

Austin, Texas: during a thunder storm on the 17th, several objects in this city were struck by lightning.

Montgomery, Alabama: the telephone wires in this city were damaged by lightning during the thunder storm on the night of the 23-24th.

#### OPTICAL PHENOMENA.

##### SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

*New England.*—2d to 8th, 10th, 11th, 13th to 15th, 17th to 19th, 21st to 25th, 29th to 31st.

*Middle Atlantic states.*—1st, 10th to 12th, 16th, 18th, 22d, 25th, 28th.

*South Atlantic states.*—3d, 4th, 9th, 10th, 12th, 17th to 20th, 22d, 24th, 26th to 28th.

*Florida peninsula.*—Archer, 24th.

*Eastern Gulf states.*—18th, 20th, 24th.

*Western Gulf states.*—3d, 10th, 16th, 18th, 21st, 22d, 25th, 27th, 30th.

*Tennessee and Ohio valley.*—4th, 9th, 12th, 16th, 17th, 22d to 24th, 26th to 28th, 31st.

*Lower lake region.*—1st to 3d, 5th, 6th, 10th, 13th, 14th, 16th, 21st, 22d, 24th.

*Upper lake region.*—1st, 4th, 6th, 8th, 10th, 14th, 16th, 20th, 25th, 26th, 28th, 30th.

*Upper Mississippi valley.*—2d, 3d, 6th, 7th, 12th to 16th, 21st to 23d, 27th, 29th.

*Missouri valley.*—5th, 8th, 10th, 11th, 13th, 16th, 22d.

*Middle slope.*—11th, 14th, 19th, 20th, 23d, 30th.

*Southern slope.*—Fort Stockton, Texas, 19th.

*Middle plateau.*—Salt Lake City, Utah, 13th; Nephi, Utah, 22d; Carson City, Nevada, 29th.

*Northern plateau.*—Boisé City, Idaho, 8th, 13th, 18th.

*North Pacific coast region.*—Roseburg, Oregon, 13th; Albany, Oregon, 29th, 31st; Bainbridge Island, Washington Territory, 29th, 30th.

*California.*—San Francisco, 1st, 2d, 3d, 7th, 12th, 17th, 18th, 21st, 25th; Fall Brook, 1st, 11th, 20th; Los Angeles and Oakland, 21st.

##### LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

*New England.*—1st, 3d to 6th, 10th to 13th, 17th, 19th.

*Middle Atlantic states.*—1st, 2d, 4th, 6th, 8th, 10th to 12th, 25th, 31st.

*South Atlantic states.*—1st, 6th, 8th to 11th.

*Florida peninsula.*—3d, 5th, 6th, 10th, 12th to 14th.

*Eastern Gulf states.*—2d, 5th, 9th to 11th.

*Western Gulf states.*—4th to 6th, 9th to 13th, 30th, 31st.

*Rio Grande valley.*—Rio Grande City, Texas, 31st.

*Tennessee and Ohio valley.*—4th, 5th, 9th, 10th, 12th, 13th, 16th, 22d, 30th, 31st.

*Lower lake region.*—4th, 6th, 10th, 13th.

*Upper lake region.*—1st, 4th to 7th, 9th, 12th, 13th, 30th.

*Extreme northwest.*—3d to 6th, 11th.

*Upper Mississippi valley.*—2d, 3d, 5th to 9th, 14th, 15th.

*Missouri valley.*—4th to 6th, 8th to 12th, 30th.

*Northern slope.*—5th to 9th, 12th.

*Middle slope.*—Fort Elliott, Texas, 5th; Yates Centre, Kansas, and Red Willow, Nebraska, 9th.

*Southern slope.*—Fort Stockton, Texas, 3d, 7th; Fort Davis, Texas, 3d, 5th, 8th.

*Southern plateau.*—Wickenburg, Arizona, and El Paso, Texas, 9th; Yuma, Arizona, 1st, 13th, 14th, 21st.

*Middle plateau.*—Nephi, Utah, 11th; Salt Lake City, Utah, 13th; Carson City, Nevada, 12th, 31st.

*Northern plateau.*—Lewiston, Idaho, 4th; Spokane Falls, Washington Territory, 7th, 10th, 11th.

*North Pacific coast region.*—1st, 3d, 7th to 10th, 12th, 13th.

*California.*—Fall Brook, 1st; San Diego, 1st, 3d; Los Angeles, 12th.

#### MIRAGE.

Vermillion, Dakota, 12th.

Webster, Dakota, 9th.

Manistique, Michigan, 28th.

Genoa, Nebraska, 9th.

Indianola, Texas, 2d, 13th.

Pretty Prairie, Kansas, 9th, 12th, 26th.

Prof. Cuthbert P. Conrad, of Fayetteville, Arkansas, furnishes the following report:

On the evening of February 26, 1884, a phenomenon known locally as "weather lights" was the precursor of a violent snow storm. I have watched these "weather lights" in this locality for four years, and, while I have lived in five states east of the Alleghanies, have never witnessed similar phenomena elsewhere. The appearance is that of rosy red to white light appearing above the horizon, 5°, 10°, and even 30°, and all the way from northeast around to southwest—sometimes only in the northwest (the most frequent quarter); sometimes first in the northeast, fading out and appearing in northwest, west, or southwest.

These lights invariably precede a change in weather—either rain or snow (i. e., a change invariably follows), but I have not been able to fix upon any definite interval of time.

The Chief Signal Officer desires to state that if others have observed similar phenomena, the reports of such observations are desirable.

#### MISCELLANEOUS PHENOMENA.

Concerning the phenomenal appearance of the sky at sunrise and sunset, which has been observed for several months past, the following reports for March have been received.

*Alabama.*—Red sunsets with afterglow were noticed at Auburn, Lee county, and at Tuscumbia, Colbert county, on the 24th and 25th.

*Arkansas.*—Lead Hill, Boone county, 31st: the red sky at sunrise and sunset has nearly disappeared; a faint display was observed on the morning of the 3d and on the evening of the 25th; on the 2d, 3d, 9th, 11th, and 12th, only a white glare was noticed.

*California.*—Hydesville, Humboldt county: during March, the unusual colors of the sky were only observed before sunrise and on the morning of the 3d, and on the evening of the 14th.

*Dakota.*—Webster, Day county: the twilights observed during March were not so bright as those of February, with the exception of the display of the 13th, which was quite brilliant.

*Florida.*—Limona, Hillsborough county: red sunrise on the 3d.

Archer, Alachua county: red sunsets on the 2d, 15th, 26th; red sunrise on the 16th.

*Georgia.*—Forsyth, Monroe county: red sunsets 20th, 21st, 26th, 28th.

*Indiana.*—Vevay, Switzerland county: orange-colored sunrise on the 27th.

*Iowa.*—Humboldt, Humboldt county: red sunsets on the 3d, 13th, and 14th.

*Kansas.*—Wellington, Sumner county, 31st: the phenomenal sunset after-glow was observed on all clear evenings during the month, its brilliancy having decreased to a great extent.

Sherlock, Finney county, 31st: the glow at sunrise and sunset was observed several times during the month, but the displays were fainter than those of November and December.

Allison, Decatur county: the glows at sunrise and sunset, observed during March, were less conspicuous than those seen in the previous months.

**Nebraska.**—Clear Creek, Saunders county: red sunsets, 1st, 26th.

**New Hampshire.**—Mount Washington: brilliant sunsets on the 1st, 18th, and 25th; brilliant sunrise on the 26th.

**New York.**—Mountainville, Orange county: brilliant sunrise on the 1st; red glow at sunset on the 3d.

**North Carolina.**—Brevard, Transylvania county: brilliant twilights on the 20th, 21st, 26th, 28th.

**Ohio.**—Wauseon, Fulton county: bright sunrises on 4th, 10th, 13th, 15th, 16th, 27th, 30th; bright sunsets 4th, 5th, 12th, 23d, 27th, 29th.

**Pennsylvania.**—Leetsdale, Alleghany county: red sunsets 3d and 4th.

**Tennessee.**—Sunset glows were observed at Grief, Bradley county, from the 24th to 31st; at Hardison's Mills, Maury county, on the 1st, 23d, 25th, 26th, 28th, and 29th; at Bolivar, Hardeman county, and Centerville, Hickman county, on all clear days; at Trenton, Gibson county, 20th and 25th; at Manchester, Coffee county, on 25th, 26th, and 28th; at Smithville, De Kalb county, on 24th, 27th, and 29th; at Nashville, on 24th and 26th.

**Texas.**—Cleburne, Johnson county: red sunrise 26th.

**Wisconsin.**—Wausau, Marathon county: brilliant sunset on the 23d, similar in appearance to those seen during September, 1883.

#### SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for March, 1884:

Date— Mch., 1884.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 10 a. m.							6	45†	
2, 5 p. m.	2	3	1	1	2	3	7	45†	
3, 4 p. m.	0	3	0	0	0	3	7	45†	
4, 10 a. m.	1	10†	0	0	0	0	8	55†	
5, 9 a. m.	0	0	1	5†	0	0	7	50†	
10, 9 a. m.	4	30†					8	65†	
13, 2 p. m.	2	20†					8	80†	
15, 4 p. m.	0	5†	1	10†	0	0	7	75†	
16, 10 a. m.	1	2	2	5	0	0	0	70†	
18, 11 a. m.	2	6	1	5	2	6	7	50†	
21, 12 m.	1	2			1	2	6	35†	
22, 9 a. m.	1	5†	0	0	0	3	7	40†	
23, 6 p. m.	0	0	0	0	0	0	6	35†	
24, 3 p. m.	1	7†	1	2	1	7†	6	40†	
25, 10 a. m.	0	0	0	0	0	0	4	35†	
29, 3 p. m.	1	2			1	2	4	20†	
30, 11 a. m.	0	0	1	2	0	0	3	12†	
31, 9 a. m.	1	8†	0	0	0	0	4	20†	

Faculae were seen at the time of every observation. †Approximated.

Mr. H. D. Govey, of North Lewisburg, Ohio, reports that sun spots were numerous during the entire month.

#### SUNSETS.

The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from one hundred and fifty-four stations show 4,748 observations to have been made, of which one was reported doubtful; of the remainder, 4,747, there were 3,993, or 84.1 per cent., followed by the expected weather.

#### EARTHQUAKES.

The following is taken from the "New York Herald," of March 18, 1884:

The ship "Elizabeth Nicholson," which arrived at Boston, March 17th, reports that on the night of December 24, 1883, in N. 16° 20', W. 27°, she experienced a severe earthquake shock, which gave the ship a violent shaking up for twenty seconds. The sensation was like that which would be caused by the ship bumping over a hard rocky bottom, or by the swift running out of a chain cable. There was an accompanying sound resembling a distant peal of thunder.

Under date of March 28, 1884, the same paper contains the following:

LONDON, March 27, 1884.—Shocks of earthquake have occurred at Agram and throughout Slavonia. A number of buildings in Deakovar were damaged.

North Platte, Nebraska: a slight shock of earthquake was felt here at 2 p. m. of the 17th.

Saint John's, Newfoundland: an earthquake shock occurred here on the 18th. It was also felt at Harbor Grace, Heart's Content, Brigns Bay, Hart's Harbor, Roberts, and Holyrood. The disturbance at Saint John's was very slight. The shock occurred between 1.30 and 1.45 p. m., the vibration being from north to south.

San Francisco, California: two shocks of earthquake of short duration occurred on the 25th, the direction of vibration being from north to south. The first shock, lasting five seconds, was felt at 4.40 p. m., and the second at 5.17 p. m., duration about two seconds. They were felt along the coast from Santa Cruz to Petaluma, and were considered to have been the severest experienced since 1868. The effect of the shocks in this city varied in different localities. On the made ground, from Montgomery street to the bay, it was most violent, while on the hills only a gentle rocking motion was felt. On San Francisco bay a sudden swell occurred, which was felt by all vessels. Considerable damage was done to the walls of the buildings on Market street. At Oakland and Berkley, on the opposite side of the bay, the shocks were reported to have been more severe than they were in this city.

Milledgeville, Baldwin county, Georgia: a slight shock of earthquake was felt here at 5 a. m. of the 31st.

Mr. J. W. Hammit, voluntary observer at College Hill, Hamilton county, Ohio, reports that three light shocks of earthquake were felt at that place at 1 p. m. of the 31st. The shocks were so slight that the direction of vibration was not determined.

#### MIGRATION OF BIRDS.

**Geese flying northward.**—Point Judith, Rhode Island, 8th, 23d; Portland, Maine, 25th; Hatteras, North Carolina, 30th; Indianola, Texas, 10th; Fort Smith, Arkansas, 2d; Erie, Pennsylvania, 18th; Davenport, Iowa, 13th, 16th; Huron, Dakota, 22d; Fort Scott, Kansas, 17th, 22d; Voluntown, Connecticut, 13th; Vermillion, Dakota, 14th; Webster, Dakota, 26th to 31st; Morrilton, Dakota, 23d; Archer, Florida, 12th; Forsyth, Georgia, 7th; Salina, Kansas, 27th; Edgington, Illinois, 14th; Swanwick, Illinois, 9th, 10th; Guttenberg, Iowa, 27th; Fort Madison, Iowa, 15th, 21st; Monticello, Iowa, 19th; Des Moines, Iowa, 13th; Indianola, Iowa, 21st, 27th; Humboldt, Iowa, 15th, 20th; Manchester, Iowa, 17th, 18th, 19th to 23d; Independence, Kansas, 11th; Yates Centre, Kansas, 12th, 16th; Allison, Kansas, 12th; West Leavenworth, Kansas, 11th; Maud, Kansas, 15th; Emmitsburg, Maryland, 11th; Sandy Springs, Maryland, 25th; Fall River, Massachusetts, 9th; Provincetown, Massachusetts, 14th; Hastings, Minnesota, 23d; Genoa, Nebraska, 12th; Crete, Nebraska, 16th; Clear Creek, Nebraska, 4th, 9th, 12th, 16th, 29th; Penn Yan, New York, 16th; Albany, Oregon, 30th; Barnesville, Texas, 7th; Lancaster, Wisconsin, 22d; Sussex, Wisconsin, 30th; Riley, Illinois, 16th.

**Geese flying southward.**—Fort Myer, Virginia, 12th; Edgington, Illinois, 20th; Mottville, Michigan, 14th; Saint Louis, Missouri, 17th.

**Ducks flying northward.**—Davenport, Iowa, 18th, 21st; Dubuque, Iowa, 27th; Indianola, Texas, 23d; Toledo, Ohio, 22d; Huron, Dakota, 22d; Omaha, Nebraska, 5th; Fort Madison, Iowa, 17th, 18th; Indianola, Iowa, 12th, 16th; Fort Scott, Kansas, 18th, 21st; Humboldt, Iowa, 17th; Manchester, Iowa, 17th, 18th, 19th to 23d; Salina, Kansas, 27th; Yates Centre, Kansas, 5th, 12th, 15th, 19th; Hastings, Minnesota, 22d, 27th; Clear Creek, Nebraska, 4th, 16th, 29th; College Hill, Ohio, 11th; Chambersburg, Pennsylvania, 23d; Sussex, Wisconsin, 16th; Edgington, Illinois, 16th.

**Ducks flying southward.**—Yates Centre, Kansas, 3d; Allison, Kansas, 19th; Sussex, Wisconsin, 21st; Edgington, Illinois, 13th, 15th.



*Cranes flying northward.*—Guttenberg, Iowa, 27th, Independence, Kansas, 31st; Yates Centre, Kansas, 26th; West Leavenworth, Kansas, 17th, 21st; Liberty Hill, Louisiana, 21st; Wickenburg, Arizona, 15th.

*Cranes flying southward.*—Yates Centre, Kansas, 25th.

#### METEORS.

Grand Rapids, Kent county, Michigan: at about 3 a. m. of the 15th, a very brilliant meteorite was observed to pass over the city in a direction southeast by south. It remained in view several seconds, disappearing on the southeastern horizon. The nucleus was in appearance about half the size of a full moon, and resembled in brilliancy an electric light. It was followed by a small tail of a bright red color. Though the moon was shining brightly at the time of the meteor's appearance, it formed a brilliant spectacle. Reports from Kalamazoo are to the effect that a meteor, which was probably the same as the above, was seen at about the same hour, and that it exploded with a loud report some forty miles beyond that village.

Webster, Day county, Dakota: at 7.35 p. m. of the 16th a meteor, apparently the size of "Jupiter," exploded in the northeastern sky at an altitude of about 30°.

Meteors were also observed at the following places:

1st.—Albany, Oregon.

13th.—Crete, Nebraska.

19th and 20th.—Lead Hill, Arkansas.

25th.—Liberty Hill, Louisiana.

27th.—Woodstock, Maryland.

28th.—Lead Hill, Arkansas.

31st.—Rowe, Massachusetts.

#### SNOW SLIDES.

Salt Lake City, Utah: a snow slide occurred at Alta, (about twenty miles southeast of this city,) on the 7th, resulting in the death of twelve persons.

Denver, Colorado: at 6 p. m., of the 10th, a snow slide descended upon Woodstock, Gunnison county, carrying away every building in that village. Seventeen persons were reported to have been buried under the snow. The snowfall in mountain districts of Colorado during the past winter is reported to have been unprecedented. Many mining camps in the southern and western parts of the state have been snow-bound since November. The towns of Durango, Silvester and Rico were still blockaded on the 10th, no trains having reached those points for several weeks. Great suffering has been experienced at Breckenridge and Montezuma, in Summit county. In the ravines and gulches of Gunnison county the snow was from fifty to one hundred feet deep.

A snow slide occurred on the Aspen mountain, Colorado, during the night of the 10th–11th, by which three employes of the Vallejo mine were killed.

#### POLAR BANDS.

Lead Hill, Arkansas, 11th.

Los Angeles, California, 7th.

Washington, District of Columbia, 22d.

Archer, Florida, 4th, 6th, 14th, 31st.

Riley, Illinois, 10th, 16th.

Yates Centre, Kansas, 4th, 30th.

Escanaba, Michigan, 25th.

Fort Assinaboine, Montana, 10th.

Clear Creek, Nebraska, 11th, 15th.

Mountainville, New York, 28th.

Charleston, South Carolina, 11th.

Stateburg, South Carolina, 22d.

Rio Grande City, Texas, 4th.

Wytheville, Virginia, 12th, 16th, 23d.

Milwaukee, Wisconsin, 5th.

#### PRAIRIE AND FOREST FIRES.

Fort Smith, Arkansas, 3d, 27th, 28th.

Yankton, Dakota, 23d, 25th, 26th, 30th.

Humboldt, Iowa, 29th, 30th.

Independence, Kansas, 1st to 5th, 8th, 11th, 15th, 17th to 29th.

Dodge City, Kansas, 9th, 10th, 14th.

Clear Creek, Nebraska, 26th.

Red Willow, Nebraska, 11th.

North Platte, Nebraska, 19th, 30th.

Fort Craig, New Mexico, 28th.

Fort Stockton, Texas, 10th.

#### DROUGHT.

Indianola, Texas: on the 1st, farmers from the surrounding counties reported that crops were suffering from the effects of drought.

Rio Grande City, Texas: a severe drought prevailed in this section during the month. On the 17th, stock growers in localities northeastward, reported that the crops were suffering in consequence of drought, and that cattle were dying on account of poor pasturage.

#### ZODIACAL LIGHT.

Prescott, Arizona, 25th.

Webster, Dakota, 1st, 12th, 13th, 15th to 18th, 24th, 26th.

Pensacola, Florida, 19th.

Escanaba, Michigan, 1st, 7th, 13th, 17th, 18th, 26th, 27th.

Variety Mills, Virginia, 8th, 15th, 16th, 20th, 24th, 26th, 27th.

#### SAND STORMS.

Yuma, Arizona, 10th, 23d.

San Carlos, Arizona, 10th.

West Las Animas, Colorado, 10th.

Fort Union, New Mexico, 4th, 5th.

Fort Stanton, New Mexico, 10th.

Fort Stockton, Texas, 24th.

#### ERRATUM.

In the January REVIEW, on page 24, first column, third line from the bottom, under MIRAGE, should read 7 a. m., instead of 7 p. m.

#### NOTES AND EXTRACTS.

The following extract has been taken from the report of the Ohio Meteorological Bureau for March, 1884, under direction of Professor T. C. Mendenhall:

The mean atmospheric pressure for March was in close agreement with that for the same month of last year, being only seven thousandths of an inch greater. The maximum pressure was greater by one-tenth of an inch than that for March, 1883; the minimum was also less, and the range almost exactly the same.

In temperature, the month was more nearly normal than in 1883. During March of last year the range of temperature was great, reaching as low a point as 17° below zero at Wauseon on the 24th, while only two days before a maximum of 75° was recorded at Ironton. The highest temperature reached during the month, this year, was 74° 0, reported from both Logan and Ironton on the 29th and 30th. The lowest was 10° 5 below zero, reported from Sidney on the 4th.

The mean temperature for the month was 37° 5, against 32° 4 for March of last year, and this is still somewhat below the normal temperature for the month, which, from the best information at hand is 38° 2. Compared with last year the mean daily range was nearly two degrees less, and the maximum daily range about 15° less.

The mean precipitation for the month was considerably in excess of that of last year, but not differing very greatly from what may be regarded as the normal amount for March. Quaker City, which reported the maximum rainfall (3.61 inches) in March, 1883, furnishes the maximum for March, 1884, the amount being 6.05 inches. The mean rainfall over the state since the beginning of the current "meteorological year" (beginning November 1, 1883) has been 19.21 inches, which is almost exactly one inch greater than for the same period of last year.

#### STATE SUMMARY OF REPORTS FOR MARCH.

Mean barometer, 30.067 inches.

Highest barometer, 30.518 inches on the 30th, at Wapakoneta.

Lowest barometer, 29.348 inches on the 26th, at Wauseon.

Range of barometer, 1.170 inches.

Mean relative humidity, 79.3 per cent.

Mean temperature, 37° 5.

Highest temperature, 74° 0 on the 29th and 30th, at Logan and Ironton.

Lowest temperature, —10° 5 on the 4th, at Sidney.

Range of temperature, 84° 5.

Mean daily range of temperature, 17° 6.

Greatest daily range of temperature, 40°.0 on the 22d, at Westerville.  
 Least daily range of temperature, 1°.5 on the 12th, at Granville.  
 Number of clear days, 5.1.  
 Number of fair days, 9.1.  
 Number of cloudy days, 16.8.  
 Number of days on which rain fell, 16.1.  
 Mean rainfall, 3.51 inches.  
 Mean daily rainfall, .106 inch.  
 Greatest rainfall, 6.05 inches at Quaker City.  
 Least rainfall, 1.87 inches at Cleveland.  
 Prevailing direction of the wind, southwest.

## WEATHER REPORT FOR MARCH, 1884.

Prepared by Prof. F. H. Snow, of University of Kansas, from observations taken at Lawrence.

The temperature, wind-velocity, and humidity of this month departed but slightly from the March averages; the rainfall was twenty-five per cent. greater than usual, and the cloudiness was somewhat in excess. Maple blossoms (*Acer dasycarpum*) were first observed on the 10th, elm blossoms on the 17th, and dog-tooth violets on the 23d.

**Mean temperature.**—41°.56, which is 0°.23 below the March average. The highest temperature was 73°, on the 30th; the lowest was 12°, on the 1st, giving a range of 61°. Mean temperature at 7 a. m., 34°.39; at 2 p. m., 49°.86; at 9 p. m., 41°.

**Rainfall.**—2.73 inches, which is 0.55 inch above the March average. Either rain or snow fell on nine days. The entire depth of snow was one inch. There were five thunder showers. The total rainfall for the three months of 1884 now completed has been 5.14 inches, which is 0.43 inch above the average for the same months in the preceding seventeen years.

**Mean cloudiness.**—58.87 per cent. of the sky, the month being 8.52 per cent. cloudier than usual. Number of clear days (less than one-third cloudy) 10; half-clear (from one to two-thirds cloudy) 7; cloudy (more than two-thirds) 14. There were two entirely clear days and six entirely cloudy. Mean cloudiness at 7 a. m., 59.60 per cent.; at 2 p. m., 57 per cent.; at 9 p. m., 60 per cent.

**Wind.**—The total run of the wind was 14,229 miles, which is 389 miles below the March average. This gives a mean daily velocity of 459 miles, and a mean hourly velocity of 19.12 miles. The highest velocity was 52 miles an hour on the 27th.

**Barometer.**—Mean for the month, 29.054, inches; at 7 a. m., 29.069 inches; at 2 p. m., 29.031 inches; at 9 p. m., 29.061 inches; maximum, 29.465 inches on the 14th; minimum, 28.451 inches on the 27th; monthly range, 1.014 inches.

**Relative humidity.**—Mean for the month, 65; at 7 a. m., 76.2; at 2 p. m., 44.5; at 9 p. m., 74.4; greatest, 100, on the 20th; least, 15, on the 12th. There were two fogs.

The following table furnishes a comparison with the month of March, in the 17 preceding years.

March.	Mean temperature.	Maximum temperature.	Minimum temperature.	Winter days.	Rain (inches).	Snow (inches).	Rainy days.	Thunder-storms.	Mean cloudiness.	Humidity.	Number of fogs.	Miles of wind.	Mean barometer.	Maximum barometer.	Minimum barometer.
1868	50.91	93.0	23.0	1	3.46	0.00	4	0	51.18	.....	0	.....	29.146	29.684	28.507
1869	35.07	81.0	1.0	0	1.15	1.00	4	0	52.81	75.4	3	.....	29.063	29.510	28.397
1870	37.69	71.0	1.0	0	1.86	0.00	2	3	56.13	64.9	0	.....	28.943	29.307	28.404
1871	47.42	78.0	25.5	0	1.73	4.00	0	3	52.00	60.4	0	.....	29.124	29.731	28.423
1872	37.23	72.0	18.0	9	2.92	3.50	6	4	55.06	63.8	0	.....	29.118	29.655	28.620
1873	42.81	74.0	4.0	5	1.34	2.30	5	1	41.93	52.8	1	.....	13,419	29.123	29.678
1874	39.50	69.5	19.0	4	2.30	4.00	7	1	62.27	67.1	1	.....	15,023	29.051	29.471
1875	37.10	82.0	9.5	13	2.61	1.00	7	1	44.84	64.9	1	.....	15,600	29.066	29.633
1876	34.25	66.0	0.0	11	4.51	17.00	11	0	60.45	69.4	1	.....	13,981	29.108	29.537
1877	40.03	81.0	7.0	6	3.40	5.00	7	2	54.99	67.2	1	.....	11,994	29.005	29.372
1878	50.90	81.0	27.0	0	2.67	0.00	0	5	40.36	67.6	0	.....	13,787	29.165	29.662
1879	48.22	87.0	11.0	7	0.37	0.00	5	0	46.02	56.1	0	.....	13,841	29.133	29.591
1880	42.38	79.0	2.5	6	2.03	3.00	5	2	44.94	63.4	1	.....	16,231	29.043	29.460
1881	37.47	77.0	14.0	6	1.66	8.00	7	1	45.79	70.3	0	.....	16,608	29.126	29.676
1882	46.90	79.0	17.0	3	1.62	9.00	5	1	40.22	64.9	0	.....	12,080	29.164	29.774
1883	40.90	69.0	16.0	3	1.38	0.00	7	1	48.92	65.6	0	.....	14,229	29.054	29.405
1884	41.56	73.0	12.0	7	2.73	1.00	9	5	58.87	65.0	2	.....	.....	.....	.....
Mean	41.78	77.2	12.0	6	2.21	3.44	7	2	50.35	64.9	0.5	14,586	29.090	29.575	28.500

In the column of minimum temperatures a dash indicates temperature below zero.

## REPORT OF THE MISSOURI WEATHER SERVICE, MARCH, 1884.

The mean temperature of the past month was, at the central station, 41°.8, which is 1°.6 below the normal mean temperature for March. There have been four instances during the past forty-seven years when the mean temperature was as low or lower than that of the past month.

The month taken throughout the state has been generally stormy and cloudy, there being many days when the sun was not seen—one station records twenty-eight cloudy days out of the thirty-one. Entering, as was recorded by almost all the observers, with a storm, snow in some parts, it continued with but little intermission to be stormy and inclined to cloudiness, with light precipitation, throughout the month.

The lowest temperatures, without any exception, were observed on the third of the month, the lowest being observed at Kirksville—3° below zero.

This low temperature coincides with lowest daily mean of the month as shown by Dr. Engleman's series. Another cold wave was also generally observed on the 8th.

The higher maximum temperatures were during the latter decade of the month, high temperatures being also observed on the 11th and 12th.

The precipitation at the central station was somewhat below the normal amount, it being 3.63 inches, or 0.74 less than the normal for Saint Louis. The amount was comparatively small considering the number of days—eleven at Saint Louis.

No snow was seen after the first decade of the month.

Hail was observed on the 7th and 25th at the central station, on the 7th and 27th at Greenfield, on the 11th at Ironton, and on the 24th at Miami.

The wheat crop is generally reported as doing well. The light but continued precipitation has somewhat retarded the sowing of the early crops, the ground being too damp for plowing.

FRANCIS E. NIPHER, Director.

Washington University, April 9, 1884.

The following meteorological summary for March, 1884, has been forwarded by Hon. A. J. McWhirter, director of the Tennessee Weather Service:

## SUMMARY OF WEATHER REPORT FOR MARCH, 1884, PREPARED BY THE BUREAU OF AGRICULTURE.

Mean temperature, 49°.

Highest temperature, 80°, on the 22d at Tennessee University, Knoxville, and on the 28th at Flippin, Lauderdale county.

Lowest temperature, 10°, on the 2d, at Andersonville.

Range of temperature, 70°.

Greatest daily range of temperature, 40°, on the 21st, at Hohenwald.

Least daily range of temperature, 0°, on the 9th, at Riddleton; on the 13th, at Smithville; and on the 25th, at Ashwood; and 1°, on the 13th, at Chuckaluck, Manchester, Andersonville, and Grief.

Mean depth of rainfall, 7.90 inches.

Mean daily rainfall, .255 inch.

Greatest depth of rainfall, 14.90 inches, at Smithville.

Least depth of rainfall, 3.17 inches, at Sailor's Rest.

Average number of clear days, 7.

Average number of fair days, 8.

Average number of cloudy days, 16.

Average number of days on which rain or snow fell, 11.2.

Mean depth of snow fall, 2.24 inches.

Prevailing direction of wind, north.

The days on which the greatest rainfall occurred were the 5th, 6th, 7th, 11th, 12th, 18th, 22d, and 25th. The greatest daily rainfall occurred on the 5th, the average for the state being 1.80 inches. The greatest at any one station was 3.50 inches, reported on the 5th, at Fostoria and Kingston Springs. The heaviest fall occurred on the 25th at Kingston Springs, being 1.67 inches in thirty minutes.

Mr. W. H. Ragan, director of the "Indiana Weather Service," furnishes the following meteorological summary for March, 1884:

Districts.	Mean temperature.	Precipitation.
	°	Inches.
Mean for northern counties.....	37.4	3.03
Mean for central counties.....	37.7	2.40
Mean for southern counties.....	44.3	2.73
Mean for state.....	39.8	2.74

Mr. S. R. Thompson, director of the "Nebraska Weather Service," furnishes the following report:

## NEBRASKA WEATHER SERVICE, BULLETIN FOR MARCH, 1884.

The month was usually warm, with an extraordinary amount of rain.

**Rainfall.**—The average by sections was as follows: southeast, 2.75 inches; northeast, 3.05 inches; southwest, 1.90 inches; northwest, 2.01 inches. Average for the entire state, 2.42 inches. The rainfall at Omaha has been equalled in March but twice in thirty years.

**Temperature.**—The mean temperature of the air was 35°.25. The average of all noon observations was 44°.30.

The following were some of the maximum and minimum temperatures:

Omaha, maximum, 67°.0, minimum, —3°.0; North Platte, maximum, 65°.0, minimum, —1°.0; DeSoto, maximum, 68°.0, minimum, —4°.0; Agricultural College, maximum, 67°.0, minimum, 3°.0; Crete, maximum, 73°.0 on 9th; minimum, —4°.6 on 9th; Peru, maximum, 70°.0, minimum, 1°.

**Mean relative humidity.**—Omaha, 73.3; North Platte, 75.5; DeSoto, 76.7; Agricultural College, 76.08 per cent.

**Wind.**—Number of miles travelled: Omaha, 5,819 miles; North Platte, 6,723 miles. Mean direction—Omaha, north; North Platte, northwest. Greatest velocity—Omaha, 24 miles per hour, southeast on 27th; North Platte, 38 miles, northeast.

**Miscellaneous.**—Thunder storms were observed at Superior on the 1st, 17th, 20th, 21st, 24th; at DeSoto on 1st, 8th, 6th, 9th, 12th, 27th, 30th, 31st; Beaver Creek on 10th, 27th, 30th, 31st; Genoa on 30th, 31st; Nebraska



City 4th, 9th; Red Willow on 15th, 27th, 30th, 31st; Ashland on 20th, 21st, 27th, 31st; Johnson on 17th, 20th; Stromsburg on 20th, 30th, 31st; Keene on 20th, 30th, 31st; Fairbury on 20th, 30th; Weeping Water on 22d, 27th; Hastings on 21st, 27th; Dawson on 27th, 30th, 31st; Pawnee City on 17th, 20th, 21st, 24th, 26th, 31st; Syracuse 21st.

Grain sowing began at Keene about the 10th. At the same place a bright lunar halo was observed on 12th.

Phoebe birds on 9th, robins on 10th, and red birds on 11th, heard singing at Peru.

Ice broke up in the Missouri at DeSoto on the 22d, and at Nebraska City on the 15th.

Blackbirds and ducks were seen at DeSoto on 13th, and robins and blue birds at Nebraska City on the 12th.

Ice broke up and was running in the Loup at Beaver Creek on the 13th. Meadow larks seen on 15th at same place.

George Sheed, at Ashland, reports robins on the 13th, larks on the 15th, blue birds on the 16th, blackbirds on the 18th, sand hill cranes on the 22d.

At Lincoln robins were observed on the 18th, and blue birds on the 20th. Also solar halo on the 3d, and lunar halo on the 18th.

Blue birds were seen at Crete on the 23d, robins at Table Rock on the 18th, and larks at Genoa on the 16th.

Seeding wheat began at Genoa on the 19th.

At Red Willow blackbirds were observed on the 14th, meadow larks on the 16th, and robins on the 23d.

The following extracts have been taken from the report of the "Alabama Weather Service" for the month of March, 1884, under direction of Professor P. H. Mell, jr.:

AGRICULTURAL AND MECHANICAL COLLEGE,  
AUBURN, ALABAMA, April 1, 1884.

Meteorology has long since been demonstrated to be practical, and it is rapidly assuming a place of prominence among those sciences and arts that are pronounced by experience to be necessary for the successful prosecution of commercial, mechanical, and agricultural affairs. The rapid advancement of this science is in no little degree due to the excellent and valuable work performed by the Chief Signal Officer and his efficient corps of assistants. In order to bring the benefits of the system to the door of each person in the United States the Chief Signal Officer has considered it wise to advise the legislatures of the states to organize state weather services. The importance of these services is made evident from the fact that the causes which govern the circulation of the atmosphere are controlled by fixed laws, in most instances well understood; and if the territory under observation be extensive enough, with stations thickly scattered throughout its length and breadth, the conditions of the weather can be foretold with astonishing exactness twenty-four hours in advance. How important are these predictions to the farmer!—to know that he can safely expose his hay and grain to the beneficial rays of the sun so many hours without their being destroyed by rain.

By the rapid multiplication of stations through the instrumentality of these state services, the signal officer is furnished with data that will enable him not only to watch the progress of great storms, but also to keep under his eye all local changes and phenomena constantly taking place in the atmosphere throughout the Union.

It is the intention to place this system on the same basis with those already in successful operation in Ohio, Kansas, Tennessee, Missouri, Indiana, Iowa, Illinois, and Nebraska; and at the meeting of the next legislature an appeal will be made to that body to recognize the importance of such work to the state of Alabama, and by proper enactment legalize the service as a state organization. In the meantime Judge E. C. Betts, our efficient Commissioner of Agriculture, has kindly consented to give me all the assistance in his power, and with this strong co-operation I can predict no other result than one of success for the Alabama weather service.

March, in some respects, has been a remarkable month. Very heavy rainfalls are reported from all sections of the state. Creeks and rivers have been unusually full; there have been washouts and overflows in consequence, damaging railroads, etc. Farmers are very backward with their crops, many having their seed, fertilizers, etc., washed away; the first planting in many places almost a failure.

The maximum rainfall was reported from Clanton, 12.75 inches, and the records from all the observers indicate an unusual fall of rain. The average precipitation for the whole state is 9.35. There was only an average of six clear days, and an average of twelve thoroughly cloudy days. Rain fell on an average of eleven days. The days on which rains were general were the 4th, 7th, 8th, 12th, 13th, 18th, 19th, 22d, 23d, and 25th. The heaviest rains occurred on the 8th and 18th.

Trinity, Tusculumbia, and Florence report slight snow on the 1st, 2d, and 4th. Florence notes hail on the 19th. The newspapers mention a very heavy hail storm at Jefferson and vicinity on the 25th, injuring a good deal of property.

The hottest days of the month generally were the 25th and 28th.

The coldest day was the 1st.

The average for the month was 59°.02.

The highest temperature was 83°.9, at Mobile on the 28th.

The lowest temperature was 22°.8, at Chattanooga, Tennessee, on the 1st.

The range of temperature was 61°.1.

Several destructive tornadoes have been reported from different stations. A newspaper account locates one of these storms on the 11th, in Pickens and Greene counties, that blew down a number of houses and fences.

The Eufaula Bulletin describes another storm that swept through Barbour county at 2 a. m. on the 24th. It was accompanied by the usual electric display and torrents of rain. Its track was about one-quarter of a mile wide. Several persons were badly injured and one man reported killed, and a number of persons lost buildings, fences, and other property on their premises.

On the 25th a tornado passed through northeast Alabama, continuing on into Georgia, doing great damage in its track to property.

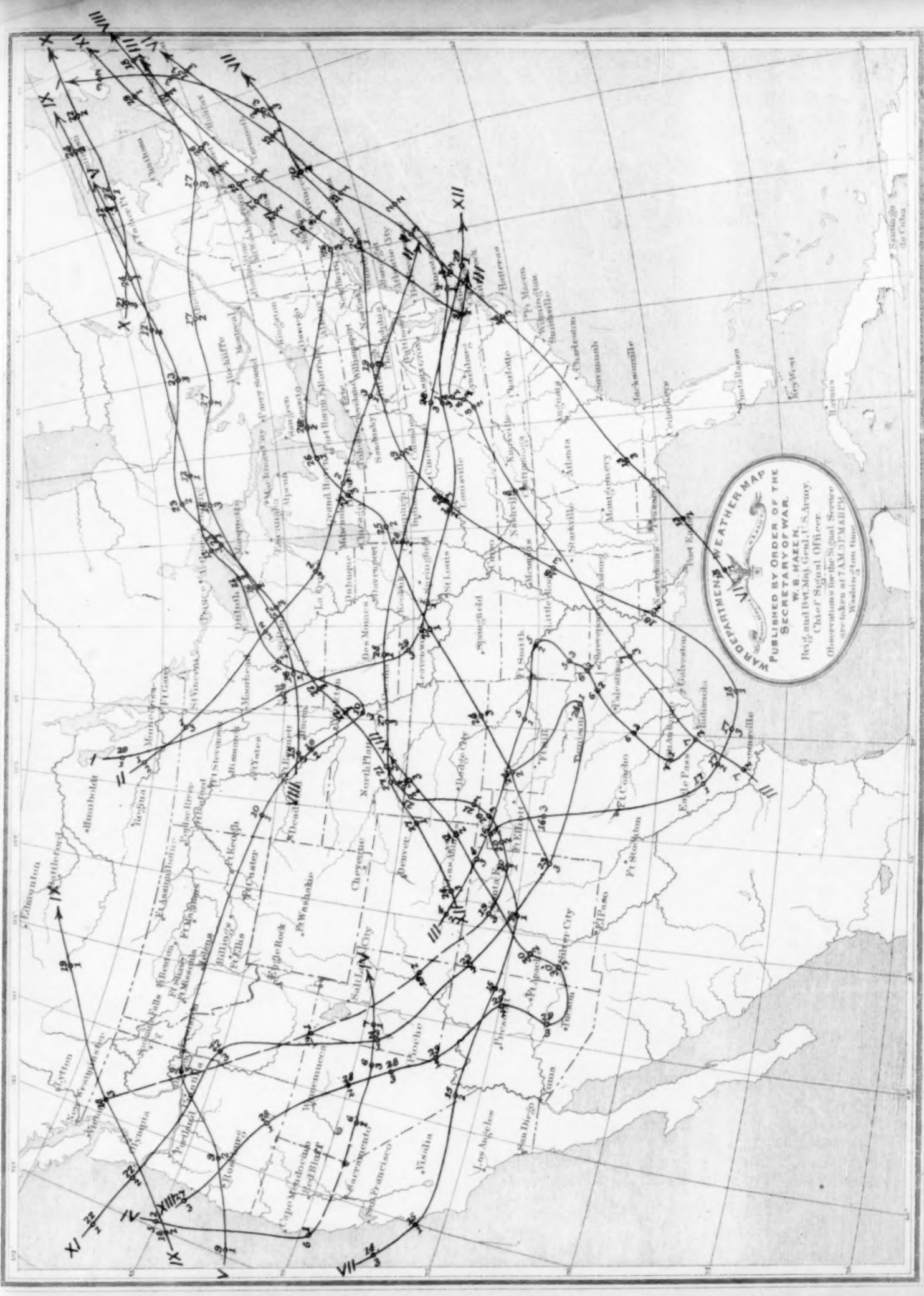
About the same time the Enquirer-Sun, of Columbus, Georgia, describes another tornado that swept through Beat One, in Chambers county, five miles north of Fredonia. It destroyed everything in its path. No lives reported lost.

It is to be greatly regretted that the accounts of these storms are so meagre. It will be gratifying to me, and of great service to the system, if in future, papers published near tracks of tornadoes will send me copies of issues containing descriptions of these commotions of the atmosphere.





Chart I. Tracks of Low-Barometer Areas, March, 1884.



Signal Office Land

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----



Chart II. Ocean Storm Tracks, March, 1884.

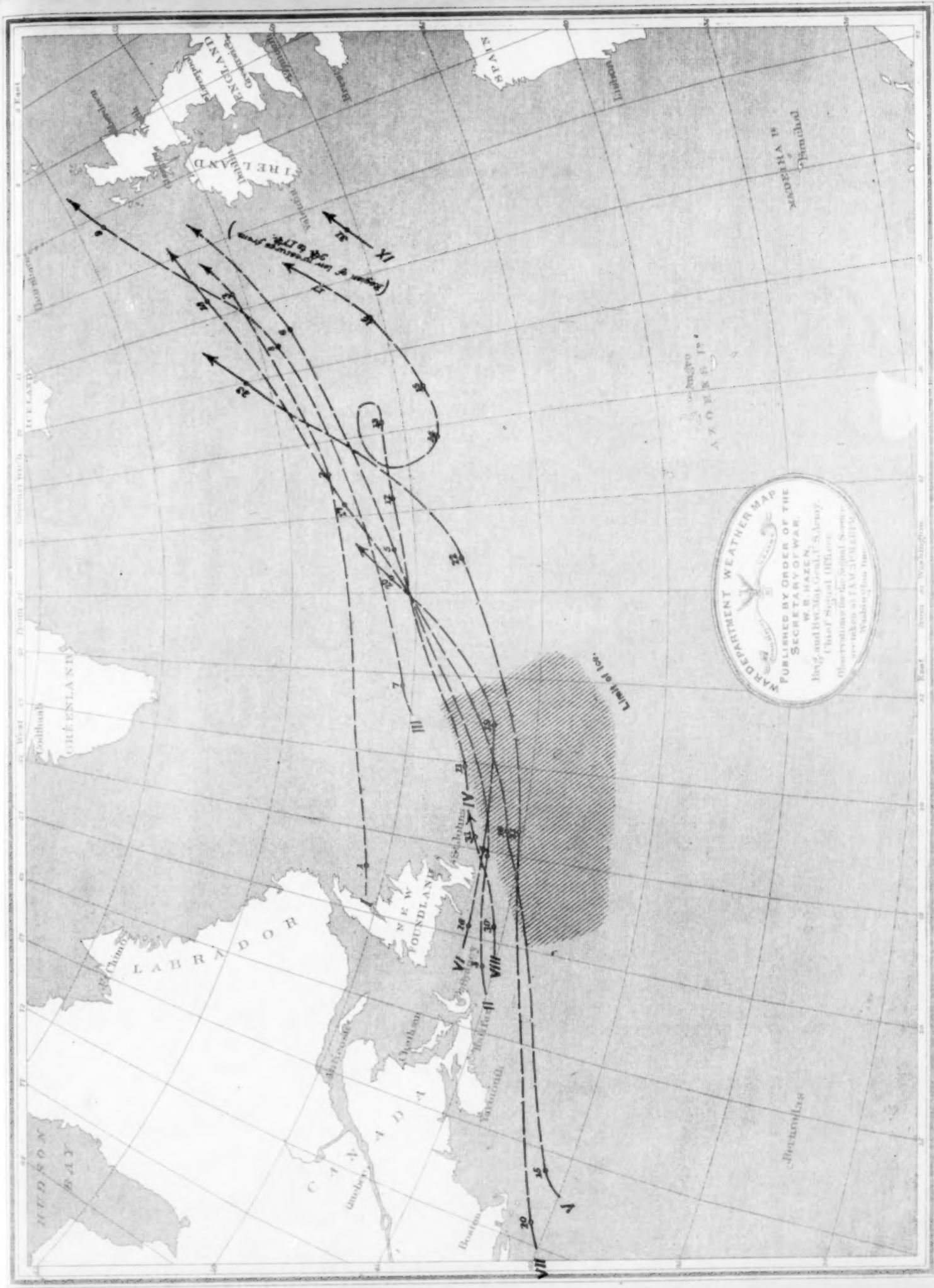
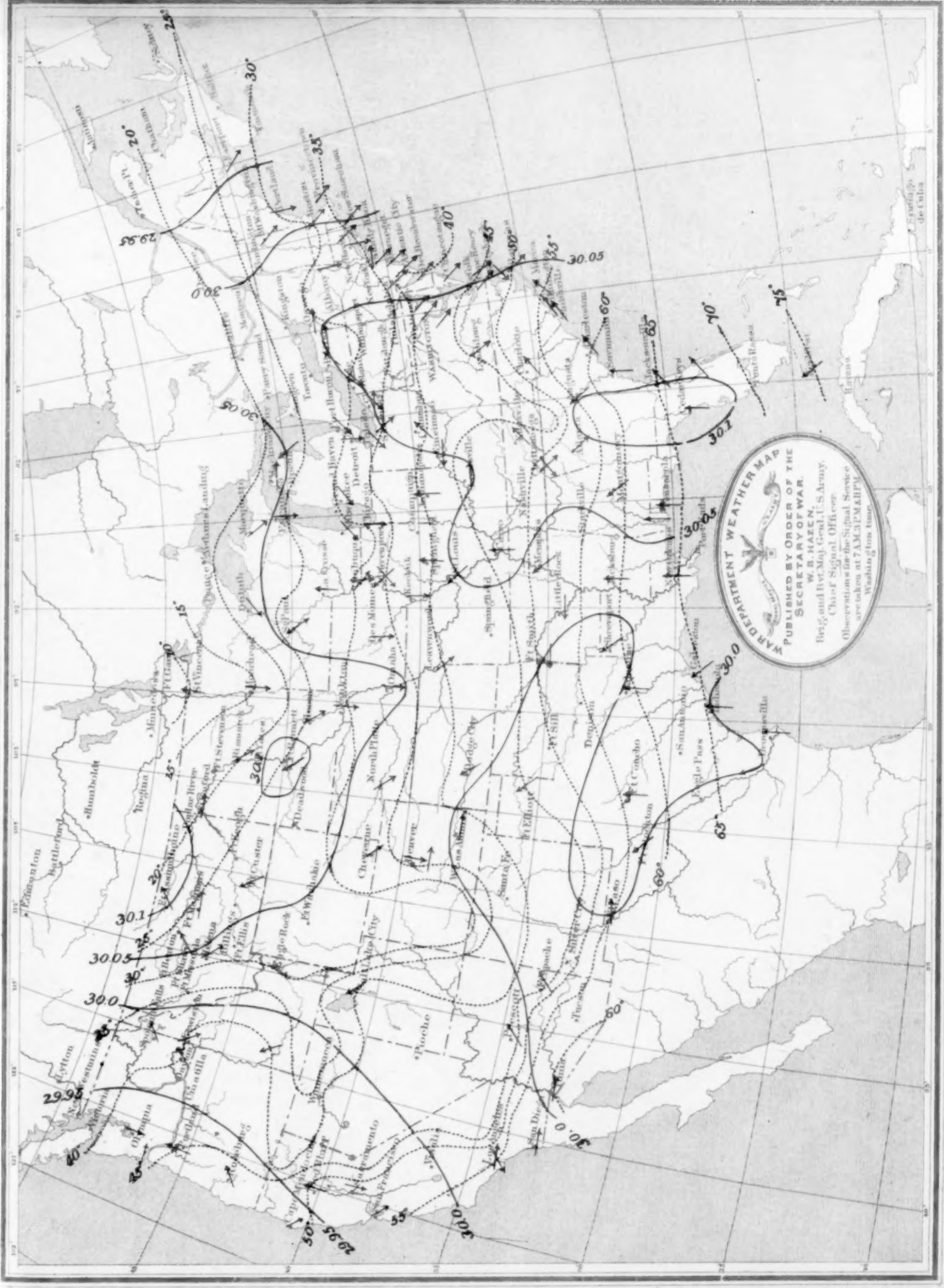






Chart III. Isobars, Isotherms, and Winds. March, 1884.



Signal Office Lath

[illegible]



Chart IV. Precipitation, March, 1884.

